# THE EXTERNALIZED SURFACE USER'S GUIDE v4

P. Le Moigne

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# Chapitre 1

# Overview of the externalized surface sequence

The externalized surface facilities do not contain only the program to run the physical surface schemes, but also those producing the initial surface fields (before the run) and the diagnostics (during or after the run). All these facilities are listed, below, and they separate in 4 main parts :

## 1.1 The sequence

1. **PGD** (routine pgd_surf_atm.f90) : this program computes the physiographic data file (called PGD file below). At this step, you perform 3 main tasks :
   (a) You choose the surface schemes you will use.
   (b) You choose and define the grid for the surface
   (c) The physiographic fields are defined on this grid.

   Therefore, the PGD file contains the spatial characteristics of the surface and all the physiographic data necessary to run the interactive surface schemes for vegetation and town.
2. **PREP** (routine prep_surf_atm_n.f90) : this program performs the initialization of the surface scheme prognostic variables, as temperatures profiles, water and ice soil contents, interception reservoirs, snow reservoirs.
3. **run of the schemes** (routine coupling_surf_atm_n.f90) : this performs the physical evolution of the surface schemes. It is necessary that this part, contrary to the 2 previous ones, is to be coupled within an atmospheric forcing (provided either in off-line mode or via a coupling with an atmospheric model).
4. **DIAG** (routine diag_surf_atm_n.f90) : this computes diagnostics linked to the surface (e.g. surface energy balance terms, variables at 2m of height, etc...). It can be used either during the run (adding these diagnostics in the output file(s) of the run), or independantly from the run, for a given surface state (still, an instantaneous atmospheric forcing is necessary for this evaluation).

In addition, in order to read or write the prognostic variables or the diagnostics variables, respectively, in the surface files, the following subroutines are used : init_surf_atm_n.f90, write_surf_atm_n.f90 and write_diag_surf_atm_n.f90.

## 1.2 The atmospheric models using the externalized surface

The externalized surface can presently be used in :

1. in offline mode
2. MESONH
3. AROME

For each model, additionnal possibilities of the surface, especially the ability to read and write in files with particular formats, are added :

### 1.2.1 in offline mode

In this case, several types of files can be used :

- *ASCII files*, not efficient in term of storage, but completely portable.
- *netcdf files*, that can be used by the program code "OFFLIN".
- *BINARY files*, increases the efficiency of the system.
- *LFI files*, increases the efficiency of the system. This special format is used in meso-NH and Arome models for surface fields.
- *FA files*, This special format is used for Arpege and Aladin models.

currently, **PGD** and **PREP** steps may be done using any of the format listed above, and also the run produces time series of each variable (prognostic or diagnostic) in ASCII, NETCDF, LFI or FA files and the output instant of the run in an ASCII, LFI or FA file.

The namelists are all included in the namelist file named OPTIONS.nam

### 1.2.2 in MESONH

In this case, MESONH FM files are used. The parallelization of the surface fields is done during the reading or writing of the fields by the FMREAD and FMWRIT routines.

#### Initialization of surface fields integrated in MESONH programs

In MESONH, there are usually 2 ways to produce initial files, depending if you want to use real or ideal atmospheric conditions. However, from the surface point of view, there is no difference between these 2 main possibilities of fields (real -e.g. from operationnal surface scheme

in an operationnal model- or ideal -e.g. uniform-), whatever the treatment done for the atmospheric fields. This is allowed because the same externalized routines corresponding to **PGD** and **PREP** are used :

In the case of realistic atmospheric fields, the MESONH programs calling the surface are :

1. PREP_PGD : it uses the **PGD** facility of the surface
2. PREP_NEST_PGD : surface fields are only read and rewritten, except the orography that is modified (the modification of the orography itself is considered as an atmospheric model routine, as orography is also a field of the atmospheric model).
3. PREP_REAL_CASE : it uses the **PREP** facility of the surface, that can produce either ideal or realistic surface fields.
4. SPAWNING : it does not produce surface fields any more. The surface fields will be recreated during the PREP_REAL_CASE step following the SPAWNING.

In the case of ideal atmospheric fields, the MESONH program calling the surface is :

1. PREP_IDEAL_CASE : it uses both the **PGD** and **PREP** facilities of the surface. Ideal or realistic (the latter only in conformal projection) physiographic fields can be either produced or read from a file. Then the prognostic surface variables, either ideal or realistic, can be computed by **PREP**.

If you use MESONH atmospheric model, the input and output surface files are the same as the atmospheric ones, so there is no need to specify via surface namelists any information about the input or output file names.

**Namelist NAM_PGDFILE**

Note however that, in PREP_PGD (just before the call to the surface physiographic computation in **PGD**, for which the namelists are described in the next chapter), there is a namelist to define the output physiographic file :

| Fortran name | Fortran type |
|---|---|
| CPGDFILE | string of 28 characters |

**MESONH run and diagnostics**

Then, the MESONH run can be done. During this one, the diagnostics can be, or not, be computed.

In DIAG, the surface diagnostics can also be recomputed.

### 1.2.3 in AROME

In this case, MESONH FM files are also used, for the surface only. The parallelization of the surface fields is done during the reading or writing of the fields by parallelization routines of ALADIN atmospheric model.

# Chapitre 2

# The physiographic fields

## 2.1 Overview of physiographic fields computation : PGD

The physiographic fields are averaged or interpolated on the specified grid by the program **PGD**. They are stored in a file, called PGD file, but only with the physiographic 2D fields, the geographic and grid data written in it.

During the **PGD** facility :

1. You choose the surface schemes you will use.
2. You choose and define the grid for the surface.
3. The physiographic fields are defined on this grid.

### 2.1.1 Choice of the grid

There are 3 possibilities. 2 are always possible, one is available only if the **PGD** routine is integrated into an atmospheric model initialization facility.

1. The grid is chosen via namelists options (see below)
2. The grid is defined as a part of the grid of an already existing surface file, indicated via namelists (see below)
3. The grid is defined as being identical to the one of an atmospheric model, which is given as fortran argument in the coupling of the **PGD** surface facilities (routine PGD_SURF_ATM) into an atmospheric model initialization procedures. In this case, **all namelists that are usually used to define the surface grid are ignored**. Note that, in addition to the grid, the orography can also be given from the atmospheric file.

### 2.1.2 Choice of the physiographic fields

There are 3 main possibilities depending on LECOCLIMAP flag.

**Namelist NAM_FRAC**

This namelist defines if ECOCLIMAP mechanism based on fractions of covers will be used or not.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| LECOCLIMAP | Logical | | .TRUE. |
| XUNIF_SEA | real | between 0 and 1 | none |
| CFNAM_SEA | character (LEN=28) | | ’ ’ |
| CFTYP_SEA | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none |
| XUNIF_WATER | real | between 0 and 1 | none |
| CFNAM_WATER | character (LEN=28) | | ’ ’ |
| CFTYP_WATER | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none |
| XUNIF_NATURE | real | between 0 and 1 | none |
| CFNAM_NATURE | character (LEN=28) | | ’ ’ |
| CFTYP_NATURE | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none |
| XUNIF_TOWN | real | between 0 and 1 | none |
| CFNAM_TOWN | character (LEN=28) | | ’ ’ |
| CFTYP_TOWN | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none |

– XUNIF_SEA : uniform prescribed value of sea fraction. If XUNIF_SEA is set, file CFNAM_SEA is not used.

– CFNAM_SEA : sea fraction data file name. If XUNIF_SEA is set, file CFNAM_SEA is not used.

– CFTYP_SEA : type of sea data file (’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’)

– XUNIF_WATER : uniform prescribed value of water fraction. If XUNIF_WATER is set, file CFNAM_WATER is not used.

– CFNAM_WATER : water fraction data file name. If XUNIF_WATER is set, file CFNAM_WATER is not used.

– CFTYP_WATER : type of water data file (’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’)

– XUNIF_NATURE : uniform prescribed value of nature fraction. If XUNIF_NATURE is set, file CFNAM_NATURE is not used.

– CFNAM_NATURE : nature fraction data file name. If XUNIF_NATURE is set, file CFNAM_NATURE is not used.

– CFTYP_NATURE : type of nature data file (’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’)

– XUNIF_TOWN : uniform prescribed value of town fraction. If XUNIF_TOWN is set, file CFNAM_TOWN is not used.

– CFNAM_TOWN : town fraction data file name. If XUNIF_TOWN is set, file CFNAM_TOWN is not used.

– CFTYP_TOWN : type of town data file (’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’)

If flag **LECOCLIMAP** is set to .TRUE., there are 2 possibilities :

**ideal physiographic fields :**

These fields are either uniform (fraction of each 215 ecoclimap ecosystem, orography, or any field needed by the surface schemes). As mentionned above, orography can be, in the case of the coupling with an atmospheric model, imposed as the atmospheric model (non-uniform) field.

**realistic physiographic fields :**

**PGD** can use files to build accurate physiographic fields from geographical information. This is possible only if the grid chosen can be linked to geographical coordinates (latitude and longitude), i.e. if the grid type is "LATLONREG " or "CONF PROJ ".

The files that can be used are :

- A file describing the type of cover of the surface. This describes where are located the different cover types (forests, towns, seas, etc...). At the time being, the file provided contains the ecoclimap data (215 land covers) on the world, with a resolution of 30".
  **PGD** computes the fraction of surface coverage occupied by each type in the grid mesh.
  From this information, the surface parameter convenient for the surface schemes (such as building fraction, leaf area index, etc..) are deduced, using correspondance arrays : **a parameter has always the same value for a given cover type, anywhere in the world**.
- A file containing the orography : GTOPO30. The resolution of the file is 30" on the world. This allows to compute the model orography, and the following subgrid-scale orographic characteristics :
  - the surface of frontal obstacle (A) over the surface of the grid mesh (S) in each direction ($\sum A_{i^+}/S$, $\sum A_{i^-}/S$, $\sum A_{j^+}/S$, $\sum A_{j^-}/S$, used to compute the directional $z_{0eff}$),
  - the half height of these obstacles ($h_i^+/2$, $h_i^-/2$, $h_j^+/2$, $h_j^-/2$, used to compute the directional $z_{0eff}$),
  - These 8 parameters are used to compute the total roughness length in the four directions given by the model axis ($z_{0eff_{i+}}$, $z_{0eff_{i-}}$, $z_{0eff_{j+}}$, $z_{0eff_{j-}}$),
  - the Subgrid-Scale Orography (SSO) parameters (standard deviation $\mu_{z_s}$, anisotropy $\gamma_{z_s}$, direction of the small main axis $\theta_{z_s}$ and slope $\sigma_{z_s}$).
- For ISBA scheme, a file with the clay fraction of the (near-surface) soil. The resolution of the file provided is 5' on the world.
- For ISBA scheme, a file with the sand fraction of the (near-surface) soil. The resolution of the file provided is 5' on the world.

If **LECOCLIMAP** flag is set to .FALSE. :

**user defined physiographic fields :**

### ISBA scheme

Over natural areas, all surface parameters for each patch, at a given frequency have to be specified by the user in namelist **NAM_DATA_ISBA**.

parameters depending on the number of vegetation types :

| Fortran name | Fortran type | values | default value | description | unit |
|---|---|---|---|---|---|
| XUNIF_VEGTYPE | real | between 0 and 1 | none | vegetation type | |
| CFNAM_VEGTYPE | character (LEN=28) | | ' ' | file name | |
| CFTYP_VEGTYPE | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | file type | |

parameters depending on the number of patches and time :

| Fortran name | Fortran type | values | default value | description | unit |
|---|---|---|---|---|---|
| NTIME | integer | 12 or 36 | 36 | time dimension | |
| XUNIF_VEG | real | between 0 and 1 | none | vegetation fraction | (-) |
| CFNAM_VEG | character (LEN=28) | | ’ ’ | file name | |
| CFTYP_VEG | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none | file type | |
| XUNIF_LAI | real | | none | leaf area index | $(m^2/m^2)$ |
| CFNAM_LAI | character (LEN=28) | | ’ ’ | file name | |
| CFTYP_LAI | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none | file type | |
| XUNIF_Z0 | real | | none | roughness length | $(m)$ |
| CFNAM_Z0 | character (LEN=28) | | ’ ’ | file name | |
| CFTYP_Z0 | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none | file type | |
| XUNIF_EMIS | real | | none | emissivity | (-) |
| CFNAM_EMIS | character (LEN=28) | | ’ ’ | file name | |
| CFTYP_EMIS | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none | file type | |

parameters depending on the number of patches and soil levels :

| Fortran name | Fortran type | values | default value | description | unit |
|---|---|---|---|---|---|
| XUNIF_DG | real | | none | soil layer thickness | $(m)$ |
| CFNAM_DG | character (LEN=28) | | ’ ’ | | |
| CFTYP_DG | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none | | |
| XUNIF_ROOTFRAC | real | | none | root fraction | (-) |
| CFNAM_ROOTFRAC | character (LEN=28) | | ’ ’ | | |
| CFTYP_ROOTFRAC | character (LEN=6) | ’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’ | none | | |

parameters depending on number of patches only :

| Fortran name | Fortran type | values | default value | description | unit |
|---|---|---|---|---|---|
| XUNIF_RSMIN | real | | none | minimal stomatal resistance | $(s/m)$ |
| CFNAM_RSMIN | character (LEN=28) | | ' ' | | |
| CFTYP_RSMIN | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_GAMMA | real | | none | coefficient used in the computation of RSMIN | (-) |
| CFNAM_GAMMA | character (LEN=28) | | ' ' | | |
| CFTYP_GAMMA | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_WRMAX_CF | real | | none | coefficient for maximum interception water storage capacity | (-) |
| CFNAM_WRMAX_CF | character (LEN=28) | | ' ' | | |
| CFTYP_WRMAX_CF | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_RGL | real | | none | maximum solar radiation available for photosynthesis | $(W/m^2)$ |
| CFNAM_RGL | character (LEN=28) | | ' ' | | |
| CFTYP_RGL | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_CV | real | | none | vegetation thermal inertia coefficient | $(Km^2/J)$ |
| CFNAM_CV | character (LEN=28) | | ' ' | | |
| CFTYP_CV | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_Z0_O_Z0H | real | | none | ratio of surface roughness lengths | $(-)$ |
| CFNAM_Z0_O_Z0H | character (LEN=28) | | ' ' | | |
| CFTYP_Z0_O_Z0H | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_ALBNIR_VEG | real | | none | vegetation near-infra-red albedo | $(-)$ |
| CFNAM_ALBNIR_VEG | character (LEN=28) | | ' ' | | |
| CFTYP_ALBNIR_VEG | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_ALBVIS_VEG | real | | none | vegetation visible albedo | $(-)$ |
| CFNAM_ALBVIS_VEG | character (LEN=28) | | ' ' | | |
| CFTYP_ALBVIS_VEG | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_ALBUV_VEG | real | | none | vegetation UV albedo | $(-)$ |
| CFNAM_ALBUV_VEG | character (LEN=28) | | ' ' | | |
| CFTYP_ALBUV_VEG | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_ALBNIR_SOIL | real | | none | soil near-infra-red albedo | $(-)$ |
| CFNAM_ALBNIR_SOIL | character (LEN=28) | | ' ' | | |
| CFTYP_ALBNIR_SOIL | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_ALBVIS_SOIL | real | | none | soil visible albedo | $(-)$ |
| CFNAM_ALBVIS_SOIL | character (LEN=28) | | ' ' | | |
| CFTYP_ALBVIS_SOIL | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_ALBUV_SOIL | real | | none | soil UV albedo | $(-)$ |
| CFNAM_ALBUV_SOIL | character (LEN=28) | | ' ' | | |
| CFTYP_ALBUV_SOIL | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |

Isba-A-gs parameters depending on number of patches only :

| Fortran name | Fortran type | values | default | description | unit |
|---|---|---|---|---|---|
| XUNIF_GMES | real | | none | mesophyll conductance | $(m/s^{-1}$ |
| CFNAM_GMES | character (LEN=28) | | ' ' | | |
| CFTYP_GMES | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_BSLAI | real | | none | ratio d(biomass)/d(lai) | $(kg/m^2)$ |
| CFNAM_BSLAI | character (LEN=28) | | ' ' | | |
| CFTYP_BSLAI | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_LAIMIN | real | | none | minimum LAI | $(m^2/m^2)$ |
| CFNAM_LAIMIN | character (LEN=28) | | ' ' | | |
| CFTYP_LAIMIN | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_SEFOLD | real | | none | e-folding time for senescence | $(s)$ |
| CFNAM_SEFOLD | character (LEN=28) | | ' ' | | |
| CFTYP_SEFOLD | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_GC | real | | none | cuticular conductance | $(m/s)$ |
| CFNAM_GC | character (LEN=28) | | ' ' | | |
| CFTYP_GC | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_DMAX | real | | none | maximum air saturation deficit | $(kg/kg)$ |
| CFNAM_DMAX | character (LEN=28) | | ' ' | | |
| CFTYP_DMAX | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_F2I | real | | none | critical normilized soil water content for stress parameterization | $(-)$ |
| XUNIF_F2I | real | | none | | |
| CFNAM_F2I | character (LEN=28) | | ' ' | | |
| CFTYP_F2I | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_H_TREE | real | | none | height of trees | $(m)$ |
| CFNAM_H_TREE | character (LEN=28) | | ' ' | | |
| CFTYP_H_TREE | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_RE25 | real | | none | Ecosystem respiration parameter | $(kg/kgms^{-1})$ |
| CFNAM_RE25 | character (LEN=28) | | ' ' | | |
| CFTYP_RE25 | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_CE_NITRO | real | | none | leaf aera ratio sensivity to [nitrogen] | $(m^2/kg)$ |
| CFNAM_CE_NITRO | character (LEN=28) | | ' ' | | |
| CFTYP_CE_NITRO | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_CF_NITRO | real | | none | lethal minimum value of leaf area ratio | $(m^2/kg)$ |
| CFNAM_CF_NITRO | character (LEN=28) | | ' ' | | |
| CFTYP_CF_NITRO | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_CNA_NITRO | real | | none | nitrogen concentration of active biomass | $(kg/kg)$ |
| CFNAM_CNA_NITRO | character (LEN=28) | | ' ' | | |
| CFTYP_CNA_NITRO | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |

**TEB scheme**

Over urban areas, all surface parameters have to be specified by the user in namelist **NAM_DATA_TEB**.

| Fortran name | Fortran type | values | default | description | unit |
|---|---|---|---|---|---|
| XUNIF_BLD | real | | none | fraction of buildings | $(-)$ |
| CFNAM_BLD | character (LEN=28) | | ' ' | | |
| CFTYP_BLD | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_BLD_HEIGHT | real | | none | buildings height | $(m)$ |
| CFNAM_BLD_HEIGHT | character (LEN=28) | | ' ' | | |
| CFTYP_BLD_HEIGHT | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_WALL_O_HOR | real | | none | wall surf. / hor. surf. | $(-)$ |
| CFNAM_WALL_O_HOR | character (LEN=28) | | ' ' | | |
| CFTYP_WALL_O_HOR | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_Z0_TOWN | real | | none | roughness length for momentum | $(m)$ |
| CFNAM_Z0_TOWN | character (LEN=28) | | ' ' | | |
| CFTYP_Z0_TOWN | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_ALB_ROOF | real | | none | roof albedo | $(-)$ |
| CFNAM_ALB_ROOF | character (LEN=28) | | ' ' | | |
| CFTYP_ALB_ROOF | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_EMIS_ROOF | real | | none | roof emissivity | $(-)$ |
| CFNAM_EMIS_ROOF | character (LEN=28) | | ' ' | | |
| CFTYP_EMIS_ROOF | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_HC_ROOF | real | | none | roof layers heat capacity | $(J/K/m^3)$ |
| CFNAM_HC_ROOF | character (LEN=28) | | ' ' | | |
| CFTYP_HC_ROOF | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_TC_ROOF | real | | none | roof layers thermal conductivity | $(W/K/m)$ |
| CFNAM_TC_ROOF | character (LEN=28) | | ' ' | | |
| CFTYP_TC_ROOF | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_D_ROOF | real | | none | roof layers depth | $(m)$ |
| CFNAM_D_ROOF | character (LEN=28) | | ' ' | | |
| CFTYP_D_ROOF | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_ALB_ROAD | real | | none | road albedo | $(-)$ |
| CFNAM_ALB_ROAD | character (LEN=28) | | ' ' | | |
| CFTYP_ALB_ROAD | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_EMIS_ROAD | real | | none | road emissivity | $(-)$ |
| CFNAM_EMIS_ROAD | character (LEN=28) | | ' ' | | |
| CFTYP_EMIS_ROAD | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_HC_ROAD | real | | none | road layers heat capacity | $(J/K/m^3)$ |
| CFNAM_HC_ROAD | character (LEN=28) | | ' ' | | |
| CFTYP_HC_ROAD | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_TC_ROAD | real | | none | road layers thermal conductivity | $(W/K/m)$ |
| CFNAM_TC_ROAD | character (LEN=28) | | ' ' | | |
| CFTYP_TC_ROAD | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| XUNIF_D_ROAD | real | | none | road layers depth | $(m)$ |
| CFNAM_D_ROAD | character (LEN=28) | | ' ' | | |
| CFTYP_D_ROAD | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |

| Fortran name | Fortran type | values | default | description | unit |
|---|---|---|---|---|---|
| XUNIF_ALB_WALL | real | | none | wall albedo | $(-)$ |
| CFNAM_ALB_WALL | character (LEN=28) | | ' ' | | |
| CFTYP_ALB_WALL | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |
| XUNIF_EMIS_WALL | real | | none | wall emissivity | $(-)$ |
| CFNAM_EMIS_WALL | character (LEN=28) | | ' ' | | |
| CFTYP_EMIS_WALL | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |
| XUNIF_HC_WALL | real | | none | wall layers heat capacity | $(J/K/m^3)$ |
| CFNAM_HC_WALL | character (LEN=28) | | ' ' | | |
| CFTYP_HC_WALL | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |
| XUNIF_TC_WALL | real | | none | wall layers thermal conductivity | $(W/K/m)$ |
| CFNAM_TC_WALL | character (LEN=28) | | ' ' | | |
| CFTYP_TC_WALL | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |
| XUNIF_D_WALL | real | | none | wall layers depth | $(m)$ |
| CFNAM_D_WALL | character (LEN=28) | | ' ' | | |
| CFTYP_D_WALL | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |
| XUNIF_H_TRAFFIC | real | | none | anthropogenic sensible heat fluxes due to traffic | $(W/m^2)$ |
| CFNAM_H_TRAFFIC | character (LEN=28) | | ' ' | | |
| CFTYP_H_TRAFFIC | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |
| XUNIF_LE_TRAFFIC | real | | none | anthropogenic latent heat fluxes due to traffic | $(W/m^2)$ |
| CFNAM_LE_TRAFFIC | character (LEN=28) | | ' ' | | |
| CFTYP_LE_TRAFFIC | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |
| XUNIF_H_INDUSTRIES | real | | none | anthropogenic sensible heat fluxes due to factories | $(W/m^2)$ |
| CFNAM_H_INDUSTRIES | character (LEN=28) | | ' ' | | |
| CFTYP_H_INDUSTRIES | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |
| XUNIF_LE_INDUSTRIES | real | | none | anthropogenic latent heat fluxes due to factories | $(W/m^2)$ |
| CFNAM_LE_INDUSTRIES | character (LEN=28) | | ' ' | | |
| CFTYP_LE_INDUSTRIES | character (LEN=6) | 'DIRECT', 'BINLLF'<br>'BINLLV', 'ASCLLV' | none | | |

**SEAFLUX scheme**
Treat SST as a forcing variable. For that purpose, several SST files at a given time are required and namelist **NAM_DATA_SEAFLUX** should be filled.

| Fortran name | Fortran type | values | default | description | unit |
|---|---|---|---|---|---|
| LSST_DATA | logical | | none | flag to activate this option | (−) |
| NTIME | integer | 12 | 12 | number of SST data | (−) |
| CFNAM_SST | character (LEN=28) | | ' ' | | |
| CFTYP_SST | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none | | |
| NYEAR_SST | integer | | | | |
| NMONTH_SST | integer | | | | |
| NDAY_SST | integer | | | | |
| XTIME_SST | real | | | | |

- LSST_DATA : flag to initialize SST from a climatology
- NTIME : number of SST input files
- CFNAM_SST : SST data file name
- CFTYP_SST : type of SST data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- NYEAR_SST : year of SST data file
- NMONTH_SST : month of SST data file
- NDAY_SST : day of SST data file
- XTIME_SST : time in seconds of SST data file

How to initialise SST from external files : an example with 3 SST input files (lat, lon, value type).

```
&NAM_DATA_SEAFLUX      NTIME = 3 , LSST_DATA = T ,
                       CFNAM_SST (1)     = 'sst_1.dat                   ', CFTYP_SST (1)     = 'ASCLLV',
                       CFNAM_SST (2)     = 'sst_2.dat                   ', CFTYP_SST (2)     = 'ASCLLV',
                       CFNAM_SST (3)     = 'sst_3.dat                   ', CFTYP_SST (3)     = 'ASCLLV',
                       NYEAR_SST(1)=1985,  NMONTH_SST(1)=12,  NDAY_SST(1)=31 , XTIME_SST(1)=64800.,
                       NYEAR_SST(2)=1986,  NMONTH_SST(2)=1 ,  NDAY_SST(2)=1  , XTIME_SST(2)=43200.,
                       NYEAR_SST(3)=1986,  NMONTH_SST(3)=1 ,  NDAY_SST(3)=2  , XTIME_SST(3)=0.
/
```

- XUNIF_xxx : uniform prescribed value of parameter xxx. If XUNIF_xxx is set, file CFNAM_xxx is not used.
- CFNAM_xxx : data file name associated to parameter xxx. If XUNIF_xxx is set, file CFNAM_xxx is not used.
- CFTYP_xxx : type of sea data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')

## 2.2 Choice of the surface schemes

You must first choose the surface schemes you will use. It is not possible, once chosen, to modify the surface schemes in the later steps (**PREP**, **running of the schemes**, **DIAG**).

Depending on the schemes you use, some additional physiographic fields will be computed if they are needed for the surface scheme chosen. For example, the ISBA scheme (used for vegetation and soil) needs the fractions of clay and sand.

**Namelist NAM_PGD_SCHEMES**

This namelist defines the four schemes that will be used, one for each type of surface (sea, inland water, town, vegetation).

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CNATURE | string of 6 characters | "NONE ", "FLUX ", "TSZ0 ", "ISBA " | "ISBA " |
| CSEA | string of 6 characters | "NONE ", "FLUX ", "SEAFLX" | "SEAFLX" |
| CWATER | string of 6 characters | "NONE ", "FLUX ", "WATFLX", "FLAKE " | "WATFLX" |
| CTOWN | string of 6 characters | "NONE ", "FLUX ", "TEB " | "TEB " |

- CNATURE : scheme used for vegegation and natural soil covers . The different possibilities are :
  1. "NONE " : no scheme used. No fluxes will be cmputed at the surface.
  2. "FLUX " : ideal fluxes are prescribed. The have to be set in the fortran routine *init_ideal_flux.f90*.
  3. "TSZ0 " : In this cheme, the fluxes are computed according to the ISBA physics, but the surface characteristics (temperature, humidity, etc...) remain constant with time.
  4. "ISBA " : this is the full ISBA scheme (Noilhan and Planton 1989), with all options developped since this initial paper.
- CSEA : scheme used for sea and ocean . The different possibilities are :
  1. "NONE " : no scheme used. No fluxes will be cmputed at the surface.
  2. "FLUX " : ideal fluxes are prescribed. The have to be set in the fortran routine *init_ideal_flux.f90*.
  3. "SEAFLX" : this is a relatively simple scheme, using the Charnock formula.
- CWATER : scheme used for inland water . The different possibilities are :
  1. "NONE " : no scheme used. No fluxes will be cmputed at the surface.

2. "FLUX " : ideal fluxes are prescribed. The have to be set in the fortran routine *init_ideal_flux.f90*.
3. "WATFLX" : this is a relatively simple scheme, using the Charnock formula.
4. "FLAKE " : this is lake scheme from Mironov, 2005.

– CTOWN : scheme used for towns . The different possibilities are :

1. "NONE " : no scheme used. No fluxes will be cmputed at the surface.
2. "FLUX " : ideal fluxes are prescribed. The have to be set in the fortran routine *init_ideal_flux.f90*.
3. "TEB " : this is the Town Energy Balance scheme (Masson 2000), with all the susequent ameliorations of the scheme.

## 2.3 Definition of the grid

Note that all the namelists presented in this section are ignored if the grid is imposed, in the fortran code, from an atmospheric model. This is the case when one already have defined the atmospheric grid and one want to be sure that the surface has the same grid. For example, this is what happens in the MESONH program PREP_IDEAL_CASE (when no physiographic surface file is used).

If you are in this case, ignore all the namelists presented in this section, and only the namelists for cover and the following ones, have to be used.

### 2.3.1 Choice of the grid type

**Namelist NAM_PGD_GRID**

This namelist defines the grid type, either specified or from an existing surface file

| Fortran name | Fortran type | default value |
|---|---|---|
| CGRID | string of 10 characters | "CONF PROJ " |
| YINIFILE | string of 28 characters | none |
| YFILETYPE | string of 6 characters | none |

- CGRID : type of grid and projection . It is used **only** if a file is not prescribed (see below). The different grid possibilities are :
  1. "GAUSS " : this grid is a gaussian grid (global grid, that may be stretched, rotated, ...)
  2. "CONF PROJ " : this grid is a regular grid (in meters in x and y perpendicular directions) on conformal projection plan (Mercator, Lambert or polar stereographic).
  3. "CARTESIAN " : this grid is a regular grid (in meters in x and y perpendicular directions), with no reference to real geographical coordinates.
  4. "LONLAT REG" : this grid is defined as a regular latitude - longitude grid.
  5. "IGN " : this grid type contains all IGN (French National Geographical Institute) possible Lambert projections
  6. "NONE " : this grid is not regular. Only the number of points and the size of each grid mesh is prescribed. There is no positioning of each point compared to any other.
- YINIFILE : name of the file used to define the grid. It is possible to define the grid as a subgrid of a previously created file. This is currently possible only for files that have a "CONF PROJ " or "CARTESIAN " grid type. The exact definition of the subgrid grid chosen is prescribed in a namelist (described below), depending on the type of grid available in the file chosen. The use of a file has priority on the CGRID type.

- YFILETYPE : type of the YINIFILE file, if the latter is provided. YFILETYPE must be given. The following values are currently usable :
  - "MESONH" : the file type is a MESONH file.

### 2.3.2 Conformal projection grids (Mercator, Lambert, Polar stereographic)

**Namelist NAM_CONF_PROJ**

This namelist defines the projection in case CGRID="CONF PROJ "

| Fortran name | Fortran type | default value |
|---|---|---|
| XLAT0 | real | none |
| XLON0 | real | none |
| XRPK | real | none |
| XBETA | real | none |

- XLAT0 : reference latitude for conformal projection (real, decimal degrees)
- XLON0 : reference longitude for conformal projection (real, decimal degrees)
- XRPK : cone factor for the projection (real) :
  - XRPK=1 : polar stereographic projection from south pole
  - 1>XRPK>0 : Lambert projection from south pole
  - XRPK=0 : Mercator projection from earth center
  - -1<XRPK<0 : Lambert projection from north pole
  - XRPK=-1 : polar stereographic projection from north pole
- XBETA : rotation angle of the simulation domain around the reference longitude (real)

**Namelist NAM_CONF_PROJ_GRID**

This namelists defines the horizontal domain in case CGRID="CONF PROJ ".

| Fortran name | Fortran type |
|---|---|
| XLATCEN | real |
| XLONCEN | real |
| NIMAX | integer |
| NJMAX | integer |
| XDX | real |
| XDY | real |

- XLATCEN : latitude of the point of the center of the domain (real, decimal degrees)
- XLONCEN : longitude of the point of the center of the domain (real, decimal degrees)
- NIMAX : number of surface points of the grid in direction $x$.
- NJMAX : number of surface points of the grid in direction $y$.
- XDX : grid mesh size on the conformal plane in $x$ direction (real, meters).
- XDY : grid mesh size on the conformal plane in $y$ direction (real, meters).

**Namelist NAM_INIFILE_CONF_PROJ**

This namelists defines the horizontal domain from an existing surface file in which grid type is "CONF PROJ ". If nothing is set in the namelist, a grid identical as the one in the file is chosen.

| Fortran name | Fortran type | default value |
|---|---|---|
| IXOR | integer | 1 |
| IYOR | integer | 1 |
| IXSIZE | integer | YINIFILE size |
| IYSIZE | integer | YINIFILE size |
| IDXRATIO | integer | 1 |
| IDYRATIO | integer | 1 |

- IXOR : first point I index, according to the YINIFILE grid, left to and out of the new physical domain.
- IYOR : first point J index, according to the YINIFILE grid, under and out of the new physical domain.
- IXSIZE : number of grid points in I direction, according to YINIFILE grid, recovered by the new domain. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IYSIZE : number of grid points in J direction, according to YINIFILE grid, recovered by the new domain. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IDXRATIO : resolution factor in I direction between the YINIFILE grid and the new grid. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IDYRATIO : resolution factor in J direction between the YINIFILE grid and the new grid. If to be used in MESONH, it must only be factor of 2,3 or 5.

### 2.3.3 Cartesian grids

**Namelist NAM_CARTESIAN**

This namelist defines the projection in case CGRID="CARTESIAN "

| Fortran name | Fortran type | default value |
|---|---|---|
| XLAT0 | real | none |
| XLON0 | real | none |
| NIMAX | integer | none |
| NJMAX | integer | none |
| XDX | real | none |
| XDY | real | none |

– XLAT0 : reference latitude (real, decimal degrees)

– XLON0 : reference longitude (real, decimal degrees)

– NIMAX : number of surface points of the grid in direction $x$.

– NJMAX : number of surface points of the grid in direction $y$.

– XDX : grid mesh size on the conformal plane in $x$ direction (real, meters).

– XDY : grid mesh size on the conformal plane in $y$ direction (real, meters).

**Namelist NAM_INIFILE_CARTESIAN**

This namelists defines the horizontal domain from an existing surface file in which grid type is "CARTESIAN ". If nothing is set in the namelist, a grid identical as the one in the file is chosen.

| Fortran name | Fortran type | default value |
|---|---|---|
| IXOR | integer | 1 |
| IYOR | integer | 1 |
| IXSIZE | integer | YINIFILE size |
| IYSIZE | integer | YINIFILE size |
| IDXRATIO | integer | 1 |
| IDYRATIO | integer | 1 |

– IXOR : first point I index, according to the YINIFILE grid, left to and out of the new physical domain.

– IYOR : first point J index, according to the YINIFILE grid, under and out of the new physical domain.

– IXSIZE : number of grid points in I direction, according to YINIFILE grid, recovered by the new domain. If to be used in MESONH, it must only be factor of 2,3 or 5.

– IYSIZE : number of grid points in J direction, according to YINIFILE grid, recovered by the new domain. If to be used in MESONH, it must only be factor of 2,3 or 5.

– IDXRATIO : resolution factor in I direction between the YINIFILE grid and the new grid. If to be used in MESONH, it must only be factor of 2,3 or 5.

– IDYRATIO : resolution factor in J direction between the YINIFILE grid and the new grid. If to be used in MESONH, it must only be factor of 2,3 or 5.

### 2.3.4 Regular longitude-latitude grids

**Namelist NAM_LONLAT_REG**

This namelist defines the projection in case CGRID="LONLAT REG"

| Fortran name | Fortran type | default value |
|---|---|---|
| XLONMIN | real | none |
| XLONMAX | real | none |
| XLATMIN | real | none |
| XLATMAX | real | none |
| NLON | integer | none |
| NLAT | integer | none |

– XLONMIN : minimum longitude covered by the grid, i.e. corresponding to the west border of the domain (real, decimal degrees). XLONMIN must be smaller than XLONMAX, but no more than 360 smaller.

– XLONMAX : maximum longitude covered by the grid, i.e. corresponding to the east border of the domain (real, decimal degrees). XLONMAX must be larger than XLONMIN, but no more than 360 larger.

– XLATMIN : minimum latitude covered by the grid, i.e. corresponding to the south border of the domain (real, decimal degrees). XLATMIN must be between -90 and +90, and smaller than XLATMAX.

– XLATMAX : maximum longitude covered by the grid, i.e. corresponding to the 'right' border of the domain (real, decimal degrees). XLATMAX must be between -90 and +90, and larger than XLATMIN.

– NLON : number of surface points in the longitude direction.

– NLAT : number of surface points in the latitude direction.

### 2.3.5 Regular Lambert grids

**Namelist NAM_IGN**

This namelist defines the projection in case CGRID="IGN "

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CLAMBERT | character (len=3) | 'L1 ', 'L2 ', 'L3 ', 'L4 ', 'L2E', 'L93' | none |
| NPOINTS | integer | | none |
| XX | real | | none |
| XY | real | | none |
| XDX | real | | none |
| XDY | real | | none |

- CLAMBERT : type of Lambert prjection
  - "L1 " : Lambert I
  - "L2 " : Lambert II
  - "L3 " : Lambert III
  - "L4 " : Lambert IV
  - "L2E" : Extended Lambert II
  - "L93" : Lambert 93
- NPOINTS : number of grid points defining the grid
- XX : X coordinate of grid mesh center
- YY : Y coordinate of grid mesh center
- XDX : grid mesh size on the conformal plane in $x$ direction (real, meters).
- XDY : grid mesh size on the conformal plane in $y$ direction (real, meters).

### 2.3.6 Gaussian grids

These namelists define the projection in case CGRID="GAUSS "

**Namelist NAMDIM**

| Fortran name | Fortran type | default value |
|---|---|---|
| NDGLG | integer | none |

**Namelist NAMRGRI**

| Fortran name | Fortran type | default value |
|---|---|---|
| NRGRI | integer | none |

**Namelist NAMGEM**

| Fortran name | Fortran type | default value |
|---|---|---|
| RMUCEN | real | none |
| RLOCEN | real | none |
| RSTRET | real | none |

- NDGLG : number of pseudo-latitudes
- NRGRI : number of pseudo-longitudes on each pseudo-latitude circle starting from the rotated pole
- RMUCEN : sine of the latitude of the rotated pole
- RLOCEN : longitude of the rotated pole (radian)
- RSTRET : stretching factor (must be greater than or equal to 1)

## 2.4 Land cover fractions

**Namelist NAM_COVER**

This namelist gives the information to compute the surface cover fractions.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XUNIF_COVER | array of 573 reals | $\geq 0$ and $\sum_{i=1}^{573}$ XUNIF_COVER$(i) = 1$ | none |
| YCOVER | character (LEN=28) | | ' ' |
| YFILETYPE | character (LEN=6) | 'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV' | none |
| XRM_COVER | real | $\geq 0$ | $10^{-6}$ |
| XRM_COAST | real | $\geq 0$ | 1. |
| LRM_TOWN | logical | | .FALSE. |

– XUNIF_COVER : specified values for uniform cover fractions. For each index $i$ between 1 and 573, XUNIF_COVER$(i)$ is the fraction of the $i^{th}$ ecosystem of ecoclimap. The same fraction of each ecosystem is set to all points of the grid. The sum of all ecosystem fractions must be equal to one : $\sum_{i=1}^{573}$ XUNIF_COVER$(i) = 1$.
If XUNIF_COVER is set, it has priority on the use of an ecosystem file (see next item : YCOVER). In the case of grid without any reference to geographical coordinates ("CARTESIAN " or "NONE "), XUNIF_COVER **must** be set.

– YCOVER : ecoclimap data file name. It is used only if XUNIF_COVER is not set.

– YFILETYPE : type of YCOVER file ('DIRECT', 'BINLLV', 'BINLLF', 'ASCLLV').

– XRM_COVER : for each point, all fractions of ecosystems that are below XRM_COVER are removed (i.e. set to zero), and the corresponding area fractions are distributed among the remaining ecosystem fractions. Whatever the value of XRM_COVER, at least one ecosystem remains for each grid point.

– XRM_COAST : limit of coast coverage under which the coast is replaced by sea or inland water.

– LRM_TOWN : if .TRUE., all ecosystems containing town fractions are removed and replaced by the ecosystem corresponding to rocks.

## 2.5 Specifities of ecoclimap II classification

**Namelist NAM_ECOCLIMAP2**

This namelist allows to choose which LAI is used : a climatological one (average over years 2002-2006) or a specific year (between 2002 and 2006). This is the place to define irrigation file.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| LCLIM_LAI | logical | | .TRUE. |
| YIRRIG | character (LEN=28) | | ' ' |

- LCLIM_LAI : if .TRUE., climatological LAI is computed otherwise, the LAI corresponding to current year (if between 2002 and 2006) is used.
- YIRRIG : irrigation file name

## 2.6 Orography, subgrid orography and bathymetry

**Namelist NAM_ZS**

This namelist defines the orography file and orographic treatment to be done.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XUNIF_ZS | real | | none |
| YZS | character (LEN=28) | | ' ' (default orography is 0.) |
| YFILETYPE | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none |
| COROGTYPE | character (LEN=3) | 'AVG', 'ENV', 'SIL ', 'MAX' | 'ENV' |
| XENV | real | | 0. |
| NZSFILTER | integer | | 1 |

- XUNIF_ZS : uniform value of orography imposed on all points (real,meters). If XUNIF_ZS is set, file YZS is not used.
- YZS : data file name. If XUNIF_ZS is set, file YZS is not used. If neither XUNIF_ZS and YZS is set, then orography is set to zero.
- YFILETYPE : type of data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- COROGTYPE : type of orography (string of 3 characters) :
  - 'AVG' : mean orography $\overline{z_s}$.
  - 'ENV' : envelope relief, defined from mean orography and the subgrid orography standard deviation as $\overline{z_s} + XENV * \sigma_{z_s}$.
  - 'SIL' : silhouette relief, defined as the mean of the two subgrid silhouettes in directions x and y (if two main directions can be defined for the grid chosen).
  - 'MAX' : maximum orography over grid box (avoid averaging in case of sea/land grid box).
- XENV : enhance factor in envelope orography definition (real).
- NZSFILTER : number of iterations of the spatial filter applied to smooth the orography (integer, 1 iteration removes the $2\Delta x$ signal, 50% of the $4\Delta x$ signal, 25% of the $6\Delta x$ signal, etc[1]...).

**Namelist NAM_SEABATHY**

This namelist defines the bathymetry file

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XUNIF_SEABATHY | real | | 300 |
| YSEABATHY | character (LEN=28) | | ' ' |
| YSEABATHYFILETYPE | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' 'NETCDF' | none |
| YNCVARNAME | character (LEN=28) | | |

[1] The amplitude of the filtered signal for each wavelength $\lambda\Delta x$ is $\frac{1}{2}\left(cos(2\pi/\lambda)+1\right)$.

- XUNIF_SEABATHY : uniform value of bathymetry imposed on all points (real,meters). If XUNIF_SEABATHY is set, file YSEABATHY is not used.
- YSEABATHY : data file name. If XUNIF_SEABATHY is set, file YSEABATHY is not used. If neither XUNIF_SEABATHY and YSEABATHY is set, then bathymetry is set to zero.
- YSEABATHYFILETYPE : type of data file ('NETCDF')
- YNCVARNAME : name of variable to be read in NETCDF file

## 2.7 Namelist for ISBA scheme

**<u>Namelist NAM_ISBA</u>**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| NPATCH | integer | between 1 and 12 | 1 |
| CISBA | character (LEN=3) | '2-L', '3-L', 'DIF' | '3-L' |
| CPHOTO | string of 3 characters | 'NON', 'AGS', 'LAI', 'AST', 'LST', 'NIT' | 'NON' |
| NGROUND_LAYER | integer | $> 0$ | 3 |
| XUNIF_CLAY | real | between 0 and 1 | 0.33 |
| YCLAY | character (LEN=28) | | ' ' |
| YCLAYFILETYPE | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none |
| XUNIF_SAND | real | between 0 and 1 | 0.33 |
| YSAND | character (LEN=28) | | ' ' |
| YSANDFILETYPE | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none |
| XUNIF_RUNOFFB | real | | 0.5 |
| YRUNOFFB | character (LEN=28) | | ' ' |
| YRUNOFFBFILETYPE | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none |
| XUNIF_WDRAIN | real | | 0. |
| YWDRAIN | character (LEN=28) | | ' ' |
| YWDRAINFILETYPE | character (LEN=6) | 'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV' | none |

- NPATCH : number of patches used in ISBA. One patch corresponds to aggregated parameters. 12 patches correspond to separate energy budgets for all vegetation types present in ISBA. 3 patches correspond to bare soil types, low vegetation, trees. If CPHOTO equals 'NON' any number of patches between 1 and 12 is possible, for the other values of CPHOTO, 12 patches are required. The order and the signification of each patch is the following :
  - 1 : bare ground
  - 2 : rocks
  - 3 : permanent snow
  - 4 : deciduous forest
  - 5 : conifer forest
  - 6 : evergreen broadleaf trees
  - 7 : C3 crops
  - 8 : C4 crops
  - 9 : irrigated crops
  - 10 : grassland (C3)
  - 11 : tropical grassland (C4)
  - 12 : garden and parks

- CISBA : type of soil discretization and physics in ISBA :
  - '2-L' : force-restore method with 2 layers for hydrology
  - '3-L' : force-restore method with 3 layers for hydrology
  - 'DIF' : diffusion layer, with any number of layers
- CPHOTO : type of photosynthesis physics. The following options are currently available :
  - "NON" : none is used. Jarvis formula is used for plant transpiration.
  - "AGS" : ISBA-AGS, without evolving Leaf Area Index
  - "LAI" : ISBA-AGS, with evolving Leaf Area Index
  - "AST" : ISBA-AGS with offensive/defensive stress, without evolving Leaf Area Index
  - "LST" : ISBA-AGS with offensive/defensive stress, with evolving Leaf Area Index
  - "NIT" : ISBA-AGS with nitrogen, with evolving Leaf Area Index
- NGROUND_LAYER : number of soil layer used in case of diffusion physics in the soil (CISBA = 'DIF').
- XUNIF_CLAY : uniform prescribed value of clay fraction.
- YCLAY : clay fraction data file name.
- YCLAYFILETYPE : type of clay data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_SAND : uniform prescribed value of sand fraction.
- YSAND : sand fraction data file name.
- YSANDFILETYPE : type of sand data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')

- XUNIF_RUNOFFB : uniform prescribed value of subgrid runoff coefficient.
- YRUNOFFB : subgrid runoff coefficient data file name.
- YRUNOFFBFILETYPE : type of subgrid runoff data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_WDRAIN : uniform prescribed value of subgrid drainage.
- YWDRAIN : subgrid drainage data file name.
- YWDRAINFILETYPE : type of subgrid drainage data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')

## 2.8 Namelist for FLake scheme

**Namelist NAM_DATA_FLAKE**

Over lakes, if one wants to use Flake scheme, some parameters have to be specified by the user in the namelist **NAM_DATA_FLAKE**.

| Fortran name | Fortran type | values | default | advice value | description | unit |
|---|---|---|---|---|---|---|
| XUNIF_WATER_DEPTH | real | | | 20. | Lake depth | $(m)$ |
| YWATER_DEPTH | character (LEN=28) | | ' ' | | filename | |
| YWATER_DEPTHFILETYPE | character (LEN=6) | 'DIRECT',<br>'BINLLF',<br>'ASCLLV',<br>'BINLLV' | none | | | |
| XUNIF_WATER_FETCH | real | | | 1000. | wind fetch | $(m)$ |
| YWATER_FETCH | character (LEN=28) | | ' ' | | filename | |
| YWATER_FETCHFILETYPE | character (LEN=6) | 'DIRECT',<br>'BINLLF',<br>'ASCLLV',<br>'BINLLV' | none | | | |
| XUNIF_T_BS | real | | | 286. | temperature at the outer edge of the thermally active layer of the of the bottom sediments | $(K)$ |
| YT_BS | character (LEN=28) | | ' ' | | filename | |
| YT_BSFILETYPE | character (LEN=6) | 'DIRECT',<br>'BINLLF',<br>'ASCLLV',<br>'BINLLV' | none | | | |
| XUNIF_DEPTH_BS | real | | | 1. | depth of the sediments layer | $(m)$ |
| YDEPTH_BS | character (LEN=28) | | ' ' | | filename | |
| YDEPTH_BSFILETYPE | character (LEN=6) | 'DIRECT',<br>'BINLLF',<br>'ASCLLV',<br>'BINLLV' | none | | | |
| XUNIF_EXTCOEF_WATER | real | | | 3. | extinction coefficient of solar radiation in water | $(m^{-1})$ |
| YEXTCOEF_WATER | character (LEN=28) | | ' ' | | filename | |
| YEXTCOEF_WATERFILETYPE | character (LEN=6) | 'DIRECT',<br>'BINLLF',<br>'ASCLLV',<br>'BINLLV' | none | | | |

## 2.9 Namelist to add user's own fields

**Namelist NAM_DUMMY_PGD**

This namelist allows to incorporate into the physiographic file any surface field.

You can treat up to 999 such fields. These fields will be written on all the files you will use later(after prognostic fields initialization, or during and after run, etc...). Their name in the files are 'DUMMY_GRnnn', where nnn goes from 001 to 999.

During the execution of the programs, these fields are stored in the XDUMMY_FIELDS( :, :) (first dimension : spatial dimension, second dimension : total number of fields), in the module MODD_DUMMY_SURF_FIELD$n. You must modify the fortran source, where you want to use them.

| Fortran name | Fortran type | default value |
|---|---|---|
| NDUMMY_PGD_NBR | integer | 0 |
| CDUMMY_PGD_NAME( :) | 1000 * character (LEN=20) | 1000 * ' ' |
| CDUMMY_PGD_FILE( :) | 1000 * character (LEN=28) | 1000 * ' ' |
| CDUMMY_PGD_COMMENT( :) | 1000 * character (LEN=40) | 1000 * ' ' |
| CDUMMY_PGD_FILETYPE( :) | 1000 * character (LEN=6) | 1000 *' ' |
| CDUMMY_PGD_AREA( :) | 1000 * character (LEN=3) | 1000 *'ALL' |
| CDUMMY_PGD_ATYPE( :) | 1000 * character (LEN=3) | 1000 *'ARI' |

Only the first NDUMMY_PGD_NBR values in these arrays are meaningfull.

- NDUMMY_PGD_NBR : number of dummy fields.
- CDUMMY_PGD_NAME( :) : list of the dummy fields you want to initialize with your own data. You can give any name you want. This is a way to describe what is the field. This information is not used by the program. It is just written in the FM files.
- CDUMMY_PGD_FILE( :) : list of the names of the files containing the data for the fields you have specified in CDUMMY_PGD_NAME( :).
- CDUMMY_PGD_FILETYPE( :) : list of the types of the files containing the data for the fields you have specified in CDUMMY_PGD_NAME( :) ('DIRECT', 'LATLON', 'BINLLF', 'BINLLV', 'ASCLLV').
- CDUMMY_PGD_AREA( :) : area of meaningfullness of the fields you have specified in CDUMMY_PGD_NAME( :) ('ALL', 'NAT', 'TWN', 'SEA', 'WAT', 'LAN', respectively for everywhere, natural areas, town areas, sea, inland waters, land = natural cover + town). For example, oceanic emission of DNS is relevant on 'SEA'.
- CDUMMY_PGD_ATYPE( :) : type of averaging (during **PGD** for the fields you have specified in CDUMMY_PGD_NAME( :) ('ARI', 'INV', 'LOG', respectively for arithmetic, inverse and logarithmic averaging).

## 2.10 Namelist for chemistry anthropogenic emissions

**Namelist NAM_CH_EMIS_PGD**

This namelist is used to initialize chemistry components emissions.

You can treat up to 999 such fields. These fields will be written on all the files you will use later (after prognostic fields initialization, or during and after run, etc...). Their name in the files are 'EMIS_GRnnn', where nnn goes from 001 to 999.

During the execution of the programs, these fields are stored in the XEMIS_GR_FIELDS( :, :) (first dimension : spatial dimension, second dimension : total number of fields), in the module MODD_EMIS_GR_FIELD$n. The temporal evolution, the aggregation of prescribed emissions and the link with the corresponding chemical prognostic variables are handled by the subroutine CH_EMISSION_FLUXn.f90

| Fortran name | Fortran type | default value |
|---|---|---|
| NEMIS_PGD_NBR | integer | 0 |
| CEMIS_PGD_NAME( :) | 1000 * character (LEN=20) | 1000 * ' ' |
| CEMIS_PGD_FILE( :) | 1000 * character (LEN=28) | 1000 * ' ' |
| CEMIS_PGD_COMMENT( :) | 1000 * character (LEN=40) | 1000 * ' ' |
| NEMIS_PGD_TIME | integer | 0 |
| CEMIS_PGD_FILETYPE( :) | 1000 * character (LEN=6) | 1000 *'DIRECT' |
| CEMIS_PGD_AREA( :) | 1000 * character (LEN=3) | 1000 *'ALL' |
| CEMIS_PGD_ATYPE( :) | 1000 * character (LEN=3) | 1000 *'ARI' |

Only the first NEMIS_PGD_NBR values in these arrays are meaningfull.

- NEMIS_PGD_NBR : number of dummy fields.
- CEMIS_PGD_NAME( :) : list of the dummy fields you want to initialize with your own data. You can give any name you want. This is a way to describe what is the field. This information is not used by the program. It is just written in the FM files.
- CEMIS_PGD_FILE( :) : list of the names of the files containing the data for the fields you have specified in CEMIS_PGD_NAME( :).
- CEMIS_PGD_COMMENT( :) : list of the comments associated to each emission field.
- NEMIS_PGD_TIME( :) : list of the time of the files containing the data for the fields you have specified in CEMIS_PGD_NAME( :).
- CEMIS_PGD_FILETYPE( :) : list of the types of the files containing the data for the fields you have specified in CEMIS_PGD_NAME( :) ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV').
- CEMIS_PGD_AREA( :) : area of meaningfullness of the fields you have specified in CEMIS_PGD_NAME( :) ('ALL', 'NAT', 'TWN', 'SEA', 'WAT', 'LAN', respectively for everywhere, natural areas, town areas, sea, inland waters, land = natural cover + town). For example, oceanic emission of DNS is relevant on 'SEA'.

- CEMIS_PGD_ATYPE( :) : type of averaging (during **PGD** for the fields you have specified in CEMIS_PGD_NAME( :) ('ARI', 'INV', 'LOG', respectively for arithmetic, inverse and logarithmic averaging).

Example :

```
&NAM_CH_EMIS_PGD NEMIS_PGD_NBR  = 2,
              CEMIS_PGD_NAME(1)='COE',
      NEMIS_PGD_TIME(1)=0,
      CEMIS_PGD_COMMENT(1)='CO_00h00',
      CEMIS_PGD_AREA(1)='LAN',
              CEMIS_PGD_ATYPE(1)='ARI',
              CEMIS_PGD_FILE(1)='co_00.asc',
      CEMIS_PGD_FILETYPE(1)='ASCLLV',
      CEMIS_PGD_NAME(2)='COE',
      NEMIS_PGD_TIME(2)=43200,
      CEMIS_PGD_COMMENT(2)='CO_12h00',
      CEMIS_PGD_AREA(2)='LAN',
      CEMIS_PGD_ATYPE(2)='ARI',
      CEMIS_PGD_FILE(2)='co_12.asc',
      CEMIS_PGD_FILETYPE(2)='ASCLLV',
      CEMIS_PGD_NAME(3)='DMSE',
      NEMIS_PGD_TIME(3)=0,
      CEMIS_PGD_COMMENT(3)='dms_cte',
      CEMIS_PGD_AREA(3)='SEA',
      CEMIS_PGD_ATYPE(3)='ARI',
      CEMIS_PGD_FILE(3)='dms.asc',
      CEMIS_PGD_FILETYPE(3)='ASCLLV' /
```

# Chapitre 3

# Initialization of the prognostic fields

## 3.1 Overview of fields computation : PREP

The prognostic fields (temperature, humidity, ice, snow, etc...) are averaged or interpolated on the specified grid by the program **PREP**. They are stored in the surface file. The computation is done separately for each surface scheme.

During the **PREP** facility :

1. You initializes the date of the surface
2. You initializes the prognostic variables of the chosen sea scheme
3. You initializes the prognostic variables of the chosen lake scheme
4. You initializes the prognostic variables of the chosen vegetation scheme
5. You initializes the prognostic variables of the chosen town scheme

Here are presented the initialization procedures for the schemes that need such information (for example, scheme "IDEAL " does not need any information here, but modificaton of the code source *init_ideal_flux.f90*).

Note that for each scheme, and for some for each variable of the scheme, it is possible to initialize the prognostic fields either form an operationnal or research model, or using prescribed (usually uniform) fields.

## 3.2 Date initialization and default input data file for all schemes

**Namelist NAM_PREP_SURF_ATM**

This namelist information is used to (possibly) :

- initialize the date of all surface schemes. The namelist information is used only if no input data file is used, either from namelist or by fortran code (as in MESONH programs). If a file is used, the date is read in it.
- define the default file in which each scheme can read the needed data (e.g. temperature).

Note that, all the information given in this namelist can be erased for each scheme by the namelist corresponding to this scheme, as the information in the shceme namelists have priority on namelist NAM_PREP_SURF_ATM.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CFILE | string of 28 characters | | - atmospheric file used in the program calling the surface facilities, if any<br>- none otherwise |
| CFILETYPE | string of 6 characters | 'MESONH', 'GRIB ' | - type of the atmospheric file, if any<br>- none otherwise |
| NYEAR | integer | | none |
| NMONTH | integer | | none |
| NDAY | integer | | none |
| XTIME | real | | none |

- CFILE : name of the file used to define
  1. the date.
  2. the file in which to read the needed data (e.g. temperature).

  **The use of a file or prescribed value in each scheme namelist has priority on the data in CFILE file of namelist NAM_PREP_SURF_ATM**.
- CFILETYPE : type of the CFILE file, if the latter is provided. CTYPE must then be given. The following values are currently usable :
  - "MESONH" : the file type is a MESONH file.
  - "GRIB " : the file type is a GRIB file, coming from any of these models :
    1. "ECMWF " : european center forecast model
    2. "ARPEGE" : Arpege french forecast model
    3. "ALADIN" : Aladin french forecast local model
    4. "MOCAGE" : Mocage french research chemistry model
- NYEAR : year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).

- NMONTH : month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY : day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME : time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).

## 3.3 Sea scheme "SEAFLX"

**Namelist NAM_PREP_SEAFLUX**

This namelist information is used to initialize the "SEAFLX" sea scheme temperature.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XSST_UNIF | real | | none |
| CFILE_SEAFLX | string of 28 characters | | CFILE in NAM_PREP_SURF_ATM |
| CTYPE | string of 6 characters | 'MESONH', 'GRIB ' 'NETCDF' | CFILETYPE in NAM_PREP_SURF_ATM |
| NYEAR | integer | | none |
| NMONTH | integer | | none |
| NDAY | integer | | none |
| XTIME | real | | none |
| LSEA_SBL | logical | | F |
| LOCEAN_MERCATOR | logical | | F |
| LOCEAN_CURRENT | logical | | F |

- XSST_UNIF : uniform prescribed value of Sea Surface Temperature. This prescribed value, if defined, has priority on the use of CFILE_SEAFLX data.
- CFILE_SEAFLX : name of the file used to define the Sea surface Temperature. **The use of a file or prescribed value XSST_UNIF has priority on the data in CFILE_SEAFLX file**.
- CTYPE : type of the CFILE_SEAFLX file, if the latter is provided. CTYPE must then be given. The following values are currently usable :
  - "MESONH" : the file type is a MESONH file.
  - "GRIB " : the file type is a GRIB file, coming from any of these models :
    1. "ECMWF " : european center forecast model
    2. "ARPEGE" : Arpege french forecast model
    3. "ALADIN" : Aladin french forecast local model
    4. "MOCAGE" : Mocage french research chemistry model
  - "NETCDF" : the file type is a NETCDF file, coming from MERCATOR
- NYEAR : year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH : month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY : day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME : time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).

- LSEA_SBL : activates surface boundary multi layer scheme over sea.
- LOCEAN_MERCATOR : oceanic variables initialized from MERCATOR if T
- LOCEAN_CURRENT : initial ocean state with current (if F ucur=0, vcur=0)

## 3.4 Lake scheme "WATFLX"

**Namelist NAM_PREP_WATFLUX**

This namelist information is used to initialize the "WATFLX" sea scheme temperature.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XTS_WATER_UNIF | real | | none |
| CFILE_WATFLX | string of 28 characters | | CFILE in NAM_PREP_SURF_ATM |
| CTYPE | string of 6 characters | 'MESONH', 'GRIB ' | CFILETYPE in NAM_PREP_SURF_ATM |
| NYEAR | integer | | none |
| NMONTH | integer | | none |
| NDAY | integer | | none |
| XTIME | real | | none |
| LWAT_SBL | logical | | F |

- XTS_WATER_UNIF : uniform prescribed value of water surface temperature supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_WATFLX data.
- CFILE_WATFLX : name of the file used to define the Sea surface Temperature. **The use of a file or prescribed value XTS_WATER_UNIF has priority on the data in CFILE_WATFLX file**.
- CTYPE : type of the CFILE_WATFLX file, if the latter is provided. CTYPE must then be given. The following values are currently usable :
- "MESONH" : the file type is a MESONH file.
- "GRIB " : the file type is a GRIB file, coming from any of these models :
  1. "ECMWF " : european center forecast model
  2. "ARPEGE" : Arpege french forecast model
  3. "ALADIN" : Aladin french forecast local model
  4. "MOCAGE" : Mocage french research chemistry model
- NYEAR : year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH : month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY : day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME : time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LWAT_SBL : activates surface boundary multi layer scheme over inland water.

## 3.5 Lake scheme ”FLAKE”

**Namelist NAM_PREP_FLAKE**

This namelist information is used to initialize the ”FLAKE” sea scheme temperature.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XTS_WATER_UNIF | real | | none |
| XUNIF_T_SNOW | real | | 273.15 |
| XUNIF_T_ICE | real | | min(273.15,XTS_WATER) |
| XUNIF_T_MNW | real | | depends on XTS_WATER |
| XUNIF_T_BOT | real | | depends on XTS_WATER |
| XUNIF_T_B1 | real | | depends on XTS_WATER |
| XUNIF_H_SNOW | real | | 0. |
| XUNIF_H_ICE | real | | 0. or 0.01 if XTS_WATER ¡ 273.15 |
| XUNIF_H_ML | real | | 3. |
| XUNIF_H_B1 | real | | 1. |
| CFILE_FLAKE | string of 28 characters | | CFILE in NAM_PREP_SURF_ATM |
| CTYPE | string of 6 characters | ’MESONH’,<br>’GRIB ’ | CFILETYPE in NAM_PREP_SURF_ATM |
| NYEAR | integer | | none |
| NMONTH | integer | | none |
| NDAY | integer | | none |
| XTIME | real | | none |
| LWAT_SBL | logical | | F |

- XTS_WATER_UNIF : uniform prescribed value of water surface temperature supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_FLAKE data.
- XUNIF_T_SNOW : surface temperature of snow (K)
- XUNIF_T_ICE : surface temperature at the ice-atmosphere or at the ice-snow interface (K)
- XUNIF_T_MNW : mean water column temperature (K)
- XUNIF_T_BOT : water temperature at the bottom of the lake (K)
- XUNIF_T_B1 : temperature at the bottom of the upper layer of sediments (K)
- XUNIF_H_SNOW : snow layer thickness (m)
- XUNIF_H_ICE : ice layer thickness (m)
- XUNIF_H_B1 : thickness of the upper level of the active sediments (m)
- CFILE_FLAKE : name of the file used to define the surface temperature. **The use of a file or prescribed value XTS_WATER_UNIF has priority on the data in CFILE_FLAKE file**.
- CTYPE : type of the CFILE_FLAKE file, if the latter is provided. CTYPE must then be given. The following values are currently usable :

  - "MESONH" : the file type is a MESONH file.
  - "GRIB " : the file type is a GRIB file, coming from any of these models :
    1. "ECMWF " : european center forecast model
    2. "ARPEGE" : Arpege french forecast model
    3. "ALADIN" : Aladin french forecast local model
    4. "MOCAGE" : Mocage french research chemistry model
- NYEAR : year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH : month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY : day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME : time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LWAT_SBL : activates surface boundary multi layer scheme over inland water.

## 3.6 Vegetation scheme "ISBA "

**Namelist NAM_PREP_ISBA**

This namelist information is used to initialize the "ISBA " vegetation scheme variables : soil temperature profile, soil water and ice profiles, water intercepted by leaves, snow.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XHUG_SURF | real | | none |
| XHUG_ROOT | real | | none |
| XHUG_DEEP | real | | none |
| CFILE_WG | string of 28 characters | | CFILE_ISBA in this namelist |
| CTYPE_WG | string of 6 characters | 'MESONH', 'GRIB ' | CTYPE in this namelist |
| XTG_SURF | real | | none |
| XTG_ROOT | real | | none |
| XTG_DEEP | real | | none |
| CFILE_TG | string of 28 characters | | CFILE_ISBA in this namelist |
| CTYPE_TG | string of 6 characters | 'MESONH', 'GRIB ' | CTYPE in this namelist |
| CFILE_ISBA | string of 28 characters | | CFILE in NAM_PREP_SURF_ATM |
| CTYPE | string of 6 characters | 'MESONH', 'GRIB ' | CFILETYPE in NAM_PREP_SURF_ATM |
| NYEAR | integer | | none |
| NMONTH | integer | | none |
| NDAY | integer | | none |
| XTIME | real | | none |
| LISBA_CANOPY | logical | | F |

- XHUG_SURF : uniform prescribed value of soil water index (SWI) for the surface soil layer. This prescribed value, if defined, has priority on the use of CFILE_WG and CFILE_ISBA data.
- XHUG_ROOT : uniform prescribed value of soil water index (SWI) for the root zone soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_WG and CFILE_ISBA data.
- XHUG_DEEP : uniform prescribed value of soil water index (SWI) for the deep soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_WG and CFILE_ISBA data.
- CFILE_WG : name of the file used to define the soil water profiles. **The use of a file or prescribed value of XHUG_SURF, XHUG_ROOT and XHUG_DEEP has priority on the data in CFILE_WG file**.
- CTYPE_WG : type of the CFILE_WG file, if the latter is provided. CTYPE_WG must then be given. The following values are currently usable :
  - "MESONH" : the file type is a MESONH file.

- "GRIB " : the file type is a GRIB file, coming from any of these models :
  1. "ECMWF " : european center forecast model
  2. "ARPEGE" : Arpege french forecast model
  3. "ALADIN" : Aladin french forecast local model
  4. "MOCAGE" : Mocage french research chemistry model

- XTG_SURF : uniform prescribed value of temperature for the surface soil layer, supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_TG and CFILE_ISBA data.
- XTG_ROOT : uniform prescribed value of temperature for the root zone soil layer(s), supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_TG and CFILE_ISBA data.
- XTG_DEEP : uniform prescribed value of temperature for the deep soil layer(s), supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_TG and CFILE_ISBA data.
- CFILE_TG : name of the file used to define the soil temperature profile. **The use of a file or prescribed value of XTG_SURF, XTG_ROOT and XTG_DEEP has priority on the data in CFILE_TG file**.
- CTYPE_TG : type of the CFILE_TG file, if the latter is provided. CTYPE_TG must then be given. The following values are currently usable :
- "MESONH" : the file type is a MESONH file.
- "GRIB " : the file type is a GRIB file, coming from any of these models :
  1. "ECMWF " : european center forecast model
  2. "ARPEGE" : Arpege french forecast model
  3. "ALADIN" : Aladin french forecast local model
  4. "MOCAGE" : Mocage french research chemistry model

- CFILE_ISBA : name of the file used to define any ISBA variable. **The use of a file or prescribed value XHUG_SURF, XHUG_ROOT, XHUG_DEEP, XTG_SURF, XTG_ROOT, XTG_DEEP, CFILE_WG and CFILE_TG has priority on the data in CFILE_ISBA file**.
- CTYPE : type of the CFILE_ISBA file, if the latter is provided. CTYPE must then be given. The following values are currently usable :

  - "MESONH" : the file type is a MESONH file.
  - "GRIB " : the file type is a GRIB file, coming from any of these models :
    1. "ECMWF " : european center forecast model
    2. "ARPEGE" : Arpege french forecast model
    3. "ALADIN" : Aladin french forecast local model
    4. "MOCAGE" : Mocage french research chemistry model
- NYEAR : year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH : month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY : day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME : time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LISBA_CANOPY : activates surface boundary multi layer scheme over vegetation.

**<u>Namelist NAM_PREP_ISBA_SNOW</u>**

This namelist defines the type of snow scheme used in ISBA scheme.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CSNOW | string of 3 characters | 'D95', '3-L', 'EBA' | 'D95' |

- CSNOW : type of snow scheme. Possible snow schemes are :
  1. 'D95' : Douville et al (1995) snow scheme.
  2. '3-L' : Boone and Etchevers (2000) three layers snow scheme.
  3. 'EBA' : Bogatchev and Bazile (2005), Arpege operational snow scheme.

## 3.7 Town scheme "TEB "

**Namelist NAM_PREP_TEB**

This namelist information is used to initialize the "TEB " urban scheme variables : road, roof and wall temperature profiles, water intercepted by roofs and roads, snow, building internal temperature.

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XWS_ROAD | real | | none |
| XWS_ROOF | real | | none |
| CFILE_WS | string of 28 characters | | CFILE_TEB in this namelist |
| CTYPE_WS | string of 6 characters | 'MESONH', 'GRIB ' | CTYPE in this namelist |
| XTS_ROAD | real | | none |
| XTS_ROOF | real | | none |
| XTS_WALL | real | | none |
| XTI_BLD | real | | none |
| XTI_ROAD | real | | none |
| CFILE_TS | string of 28 characters | | CFILE_TEB in this namelist |
| CTYPE_TS | string of 6 characters | 'MESONH', 'GRIB ' | CTYPE in this namelist |
| CFILE_TEB | string of 28 characters | | CFILE in NAM_PREP_SURF_ATM |
| CTYPE | string of 6 characters | 'MESONH', 'GRIB ' | CFILETYPE in NAM_PREP_SURF_ATM |
| NYEAR | integer | | none |
| NMONTH | integer | | none |
| NDAY | integer | | none |
| XTIME | real | | none |
| LTEB_CANOPY | logical | | F |

- XWS_ROAD : uniform prescribed value of soil water interception for the road reservoir. This prescribed value, if defined, has priority on the use of CFILE_WS and CFILE_TEB data.
- XWS_ROOF : uniform prescribed value of soil water interception for the roof reservoir. This prescribed value, if defined, has priority on the use of CFILE_WS and CFILE_TEB data.
- CFILE_WS : name of the file used to define the soil water reservoirs. **The use of a file or prescribed value of XWS_ROAD and XWS_ROOF has priority on the data in CFILE_WS file**.
- CTYPE_WS : type of the CFILE_WS file, if the latter is provided. CTYPE_WS must then be given. The following values are currently usable :
  - "MESONH" : the file type is a MESONH file.
  - "GRIB " : the file type is a GRIB file, coming from any of these models :

1. "ECMWF " : european center forecast model
2. "ARPEGE" : Arpege french forecast model
3. "ALADIN" : Aladin french forecast local model
4. "MOCAGE" : Mocage french research chemistry model

– XTS_ROAD : uniform prescribed value of surface temperature for road, supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
– XTS_ROOF : uniform prescribed value of surface temperature for roof, supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
– XTS_WALL : uniform prescribed value of surface temperature for wall, supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
– XTI_BLD : uniform prescribed value of internal building temperature. This temperature is not dependent on altitude. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
– XTI_ROAD : uniform prescribed value of deep road temperature, supposed at an **altitude of 0m** (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 $Kkm^{-1}$. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
– CFILE_TS : name of the file used to define the soil temperature profile. **The use of a file or prescribed value of XTS_ROAD, XTS_ROOF, XTS_WALL, XTI_BLD or XTI_ROAD has priority on the data in CFILE_TS file**.
– CTYPE_TS : type of the CFILE_TS file, if the latter is provided. CTYPE_TS must then be given. The following values are currently usable :
– "MESONH" : the file type is a MESONH file.
– "GRIB " : the file type is a GRIB file, coming from any of these models :

1. "ECMWF " : european center forecast model
2. "ARPEGE" : Arpege french forecast model
3. "ALADIN" : Aladin french forecast local model
4. "MOCAGE" : Mocage french research chemistry model

- CFILE_TEB : name of the file used to define any TEB variable. **The use of a file or prescribed value XWS_ROAD, XWS_ROOF, XTS_ROAD, XTS_ROOF, XTS_WALL, XTI_BLD, XTI_ROAD, CFILE_WS or CFILE_TS has priority on the data in CFILE_TEB file**.
- CTYPE : type of the CFILE_TEB file, if the latter is provided. CTYPE must then be given. The following values are currently usable :
- "MESONH" : the file type is a MESONH file.
- "GRIB " : the file type is a GRIB file, coming from any of these models :
  1. "ECMWF " : european center forecast model
  2. "ARPEGE" : Arpege french forecast model
  3. "ALADIN" : Aladin french forecast local model
  4. "MOCAGE" : Mocage french research chemistry model
- NYEAR : year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH : month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY : day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME : time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LTEB_CANOPY : activates surface boundary multi layer scheme over town.

# Chapitre 4

# How to run the externalized surface physical schemes

Here are described the options available during the run of the several surface schemes.

## 4.1 "SURF_ATM" general options available over all tiles

**Namelist NAM_SURF_ATM**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| XCISMIN | real | | 6.7E-5 |
| XVMODMIN | real | | 0. |
| LALDTHRES | logical | | F |
| LALDZ0H | logical | | F |
| LDRAG_COEF_ARP | logical | | F |
| LNOSOF | logical | | F |
| XEDB | real | | 5. |
| XEDC | real | | 5. |
| XEDD | real | | 5. |
| XEDK | real | | 1. |
| XUSURIC | real | | 1. |
| XUSURID | real | | 0.035 |
| XUSURICL | real | | 4. |
| XVCHRNK | real | | 0.015 |
| XVZ0CM | real | | 0.0 |
| XRIMAX | real | | 0.0 |
| XDELTA_MAX | real | | 1.0 |

- LALDTHRES : flag to set a minimum wind and shear like done in Aladin model.
- XCISMIN : minimum wind shear to compute turbulent exchange coefficient (used only if LALDTHRES)
- XVMODMIN : minimum wind speed to compute turbulent exchange coefficient (used only if LALDTHRES)
- LALDZ0H : to take into account orography in heat roughness length
- LDRAG_COEF_ARP : to use drag coefficient computed like in Arpege/Aladin models

- LNOSOF : no parameterization of subgrid orography effects on atmospheric forcing
- XEDB, XEDC, XEDD, XEDK : coefficients used in Richardson critical numbers computation
- XUSURIC, XUSURID, XUSURICL : Richardson critical numbers
- XVCHRNK, XVZ0CM : Charnock's constant and minimal neutral roughness length over sea (formulation of roughness length over sea)
- XRIMAX : limitation of Richardson number in drag computation
- XDELTA_MAX : maximum fraction of the foliage covered by intercepted water for high vegetation

**Namelist NAM_WRITE_SURF_ATM**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| LNOWRITE_COVERS | logical | | F |
| LNOWRITE_CANOPY | logical | | F |
| LNOWRITE_TEXFILE | logical | | F |

- LNOWRITE_COVERS : if T, do not write covers in initial/restart or LBC files
- LNOWRITE_CANOPY : if T, do not write canopy prognostic variables in initial/restart or LBC files
- LNOWRITE_TEXFILE : if T, do not fill class_cover_data.tex file during the model setup

## 4.2 "SEAFLX" sea scheme options

**Namelist NAM_SEAFLUXn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CSEA_FLUX | string of 6 characters | 'DIRECT', 'ITERAT', 'COARE3', 'ECUME ' | 'ECUME ' |
| CSEA_ALB | string of 4 characters | 'UNIF', 'TA96' | 'TA96' |
| LPWG | logical | | F |
| LPRECIP | logical | | F |
| LPWEBB | logical | | F |
| LPROGSST | logical | | F |
| NTIME_COUPLING | integer | | |

- CSEA_FLUX : type of flux computation physics. The following option is currently available :
  - "DIRECT" : direct Charnock computation. No effect of convection in the the boundary layer on the fluxes formulae.
  - "ITERAT" : iterative method proposed by Fairall et al (1996) from TOGA-COARE experiment, amended by Mondon and Redelsperger (1998) to take into account effect of atmospheric convection on fluxes.
  - "COARE3" : iterative method proposed by Fairall et al (1996) from TOGA-COARE experiment, amended by cnrm/memo to take into account effect of atmospheric convection, precipitation and gustiness on fluxes.
  - "ECUME " : iterative method proposed by Fairall et al (1996) from TOGA-COARE experiment, amended by cnrm/memo to take into account effect of atmospheric convection, precipitation and gustiness on fluxes : improvement of surface exchange coefficients representation.
  - LPWG : correction of fluxes due to gustiness
  - LPRECIP : correction of fluxes due to precipitation
  - LPWEBB : correction of fluxes due to convection (Webb effect)
- CSEA_ALB : type of albedo formula. The following options are currently available :
  - "UNIF" : a uniform value of 0.135 is used for water albedo
  - "TA96" : Taylor et al (1996) formula for water direct albedo, depending on solar zenith angle $\theta$ : $\alpha_{dir} = 0.037/\left(1.1\cos(\theta)^{1.4} + 0.15\right)$
- LPROGSST : set it to .TRUE. to make SST evolve with tendency when using the 1d oceanic model
- NTIME_COUPLING : coupling time frequency between surface and the 1d oceanic model

**Namelist NAM_SURF_SLT**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CEMISPARAM | string of 5 characters | 'Vig01','Sch04' | 'Sch04" |

– "CEMISPARAM_SLT" : One-line sea salt emission parameterization type. This namelist gives the distribution of emitted sea salt of SURFEX. For Each paramterization type, a geometric standard deviation and a median radius is given. See the code init_sltn.f90 (MesoNH) or init_sltn.mnh (AROME, ALADIN) for values associated to these parameterizations. Note that if the defaut value is change, it is necessary to uses the same modes in the sea initialisation in the atmospheric model. It concerns the value of XINIRADIUS_SLT (initial radius), XINISIG_SLT (standard deviation) and CRGUNITS (mean radius definition) to have the same aerosol size distribution emitted and in the atmosphere. It is possible to do it directly in the fortran code (modd_salt.mnh in case of aladin/arome, modd_salt.f90 for MesoNH) or for MesoNH only, change the values of these variables in NAM_AERO_CONF (prep_real_case or prep_ideal_case).

## 4.3 "FLAKE" lake scheme options

**Namelist NAM_FLAKEn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| LSEDIMENTS | logical | | T |
| CFLAKE_SNOW | string of 6 characters | 'NON ', 'FLAKE ', 'ISBAES' | 'NON ' |
| CFLAKE_FLUX | string of 6 characters | 'FLAKE ', 'ISBA ' | 'FLAKE ' |

- CFLAKE_SNOW : snow scheme to be used. For the time being only option 'FLAKE ' is active
- CFLAKE_FLUX : scheme to be used to compute surface fluxes of moment, energy and water vapor. For the time being only option 'FLAKE ' is active
- LSEDIMENTS : to use the bottom sediments scheme of Flake (default)

## 4.4 "ISBA " vegetation scheme options

**Namelist NAM_SGH_ISBAn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CRUNOFF | string of 4 characters | 'WSAT', 'DT92' , 'SGH' | 'WSAT' |
| CTOPREG | string of 4 characters | 'DEF ', 'NON' | 'DEF ' |
| CKSAT | string of 4 characters | 'DEF', 'SGH' | 'DEF' |
| CRAIN | string of 3 characters | 'DEF', 'SGH' | 'DEF' |
| CHORT | string of 4 characters | 'DEF ', 'SGH' | 'DEF ' |
| LTRIP | logical | | F |
| LFLOOD | logical | | F |

- CRUNOFF : type of subgrid runoff. The following options are currently available :
  - "WSAT" : runoff occurs only when saturation is reached
  - "DT92" : Dumenill and Todini (1992) subgrid runoff formula
  - "SGH" : Decharme et al. (2006) Topmodel like subgrid runoff
- CTOPREG : kind of regression. Option activated only if CRUNOFF = 'SGH'. The following options are currently available :
  - "DEF" : Wolock and MacCabe regression between topographic indices computed at 1km and 100m resolution (recommended)
  - "NON" : no regression
- CKSAT : Activates the exponential profile for Ksat. The following options are currently available :
  - "DEF" : homogeneous profile
  - "SGH" : exponential decreasing profile with depth (due to compaction of soil)
- CRAIN : Activates the spatial distribution of rainfall intensity. The following options are currently available :
  - "DEF" : homogeneous distribution
  - "SGH" : exponential distribution which depends on the fraction of the mesh where it rains. This fraction depends on the mesh resolution and the intensity of hourly precipitation. (If the horizontal mesh is lower than 10km then the fraction equals 1).
- CHORT : Activates the Horton runoff due to water infiltration excess. The following options are currently available :
  - "DEF" : no Horton runoff
  - "SGH" : Horton runoff computed
- LTRIP : Activates TRIP river routing model (RRM) scheme
- LFLOOD : Activates the flooding scheme

**Namelist NAM_ISBAn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CC1DRY | string of 4 characters | 'DEF ', 'GB93' | 'DEF ' |
| CSCOND | string of 4 characters | 'NP89', 'PL98' | 'PL98' |
| CSOILFRZ | string of 3 characters | 'DEF', 'LWT' | 'DEF' |
| CDIFSFCOND | string of 4 characters | 'DEF ', 'MLCH' | 'DEF ' |
| CSNOWRES | string of 3 characters | 'DEF', 'RIL' | 'DEF' |
| CALBEDO | string of 4 characters | 'MEAN', 'DRY ', 'WET ', 'EVOL' | 'DRY ' |
| CROUGH | string of 4 characters | 'Z01D', 'Z04D' | 'Z04D' |
| CCPSURF | string of 3 characters | 'DRY ', 'HUM' | 'DRY ' |
| XTSTEP | real | | none |
| XCGMAX | real | | 2.E-5 |

- CC1DRY : type of C1 formulation for dry soils. The following options are currently available :
  - "DEF " : Giard-Bazile formulation
  - "GB93" : Giordani 1993, Braud 1993
- CSCOND : type of thermal conductivity. The following options are currently available :
  - "NP89" : Noilhan and Planton (1989) formula
  - "PL98" : Peters-Lidard et al. (1998) formula
- CSOILFRZ : type of soil freezing-physics option. The following options are currently available :
  - "DEF" : Boone et al. 2000 ; Giard and Bazile 2000
  - "LWT" : Phase changes as above, but relation between unfrozen water and temperature considered
- CDIFSFCOND : type of Mulch effects. The following options are currently available :
  - "DEF " : no mulch effect
  - "MLCH" : include the insulating effect of leaf litter/mulch on the surf. thermal cond.
- CSNOWRES : type of turbulent exchanges over snow. The following options are currently available :
  - "DEF" : Louis
  - "RIL" : Maximum Richardson number limit for stable conditions ISBA-SNOW3L turbulent exchange option
- CALBEDO : type of bare soil albedo. The following options are currently available :
  - "DRY " : dry bare soil albedo
  - "WET " : wet bare soil albedo
  - "MEAN" : albedo for bare soil half wet, half dry
  - "EVOL" : albedo of bare soil evolving with soil humidity
- CROUGH : type of orographic roughness length. The following options are currently available :

  - "Z01D" : orographic roughness length does not depend on wind direction
  - "Z04D" : orographic roughness length depends on wind direction
- CCPSURF : type of specific heat at surface. The following options are currently available :
  - "DRY" : specific heat does not depend on humidity at surface
  - "HUM" : specific heat depends on humidity at surface.
- XTSTEP : time step for ISBA. Default is to use the time-step given by the atmospheric coupling (seconds).
- XCGMAX : maximum value for soil heat capacity.

**Namelist NAM_SURF_DST**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CEMISPARAM | string of 5 characters | 'AMMA','Dal87','EXPLI','alf98','EXPLI' | 'AMMA' |
| CVERMOD | string of 6 characters | 'CMDVER' | 'NONE' |
| XFLX_MSS_FDG_FCT | real | | 8.0e-4 |

- "CEMISPARAM" : One-line dust emission parameterization type. This namelist gives the distribution of emitted dust of SURFEX. For Each paramterization type, a geometric standard deviation and a median radius is given. Moreover , the repatition of mass flux could be derive from the friction velocity (case of "AMMA" or "EXPLI") or imposed (case of "Dal87", "alf98", "She84" or "PaG77". See the code init_dstn.f90 (MesoNH) or init_dstn.mnh (AROME, ALADIN) for values associated to these parameterizations. Note that if the defaut value is change, it is necessary to uses the same modes in the dust initialisation in the atmospheric model. It concerns the value of XINIRADIUS (initial radius), XINISIG (standard deviation) and CRGUNITD (mean radius definition) to have the same aerosol size distribution emitted and in the atmosphere. It is possible to do it directly in the fortran code (modd_dust.mnh in case of aladin/arome, modd_dust.f90 for MesoNH) or for MesoNH only, change the values of these variables in NAM_AERO_CONF (prep_real_case or prep_ideal_case).
- "XFLX_MSS_FDG_FCT" : Value of the $\alpha$ factor representing the ratio of the vertical mass flux over the horizontal mass flux in the saltation layer (use only If CVERMOD="NONE"). This $\alpha$ factor depend on the size distribution of the aerosol consider in the model.
- "CVERMOD" New parameterization of the dust emission formulation. In development, not recommended to uses it in this version.

# Chapitre 5

# How to run the externalized surface chemical schemes

Here are described the options available during the run of the several schemes for emission and deposition of chemical species. Note that all the schemes for deposition and emission of chemical species do activate only if chemical species are present (i.e. if the coupling between atmosphere and surface include the chemical species concentrations and fluxes).

## 5.1 Chemical settings control

**Namelist NAM_CH_CONTROLn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CCHEM_SURF_FILE | string of 28 characters | | ' ' |

– CCHEM_SURF_FILE : name of general (chemical) purpose ASCII input file.

## 5.2 Chemical anthropogenic emissions

**Namelist NAM_CH_SURFn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| LCH_SURF_EMIS | logical | | .FALSE. |

– LCH_SURF_EMIS : flag to use anthropogenic emissions or not.

## 5.3 Chemical deposition over ocean

**Namelist NAM_CH_SEAFLUXn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CCH_DRY_DEP | string of 6 characters | 'NONE ', 'WES89 ' | 'WES89 ' |

- CCH_DRY_DEP : type of deposition scheme.
  - "NONE " : no chemical deposition scheme.
  - "WES89 " : Wesley (1989) deposition scheme.

## 5.4 Chemical deposition over lakes

**Namelist NAM_CH_WATFLUXn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CCH_DRY_DEP | string of 6 characters | 'NONE ', 'WES89 ' | 'WES89 ' |

- CCH_DRY_DEP : type of deposition scheme.
  - "NONE " : no chemical deposition scheme.
  - "WES89 " : Wesley (1989) deposition scheme.

## 5.5 Chemical deposition over towns

**Namelist NAM_CH_TEBn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CCH_DRY_DEP | string of 6 characters | 'NONE ', 'WES89 ' | 'WES89 ' |

- CCH_DRY_DEP : type of deposition scheme.
  - "NONE " : no chemical deposition scheme.
  - "WES89 " : Wesley (1989) deposition scheme.

## 5.6 Chemical deposition and biogenic emissions over vegetation

**Namelist NAM_CH_ISBAn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| CCH_DRY_DEP | string of 6 characters | 'NONE ', 'WES89 ' | 'WES89 ' |
| LCH_BIO_FLUX | logical | | .FALSE. |

- CCH_DRY_DEP : type of deposition scheme.
  - "NONE " : no chemical deposition scheme.
  - "WES89 " : Wesley (1989) deposition scheme.
- LCH_BIO_FLUX : flag to activate the biogenic emissions.

## 5.7 Chemical aerosol scheme (ORILAM)

**Namelist NAM_CHS_ORILAM**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| LCH_AERO_FLUX | logical | | .FALSE. |
| LCO2PM | logical | | .FALSE. |
| XEMISRADIUSI | real | | 0.05 |
| XEMISRADIUSJ | real | | 0.2 |
| XEMISSIGI | real | | 1.80 |
| XEMISSIGJ | real | | 2.00 |
| CRGUNIT | character | "MASS", "NUMB" | "NUMB" |

– LCH_AERO_FLUX : switch to active aerosol surface flux for ORILAM

– "LCO2PM" : switch to activate emission of primary aerosol (Black and Organic carbon) compute from CO emssion. Uses only if CO emission is defined in the surface field (see PREP_PGD) and if there is no data for primary aerosol emissison.

– "XEMISRADIUSI" : Aerosol flux, mean radius of aitken mode in $\mu m$ (only if LCH_AERO_FLUX=.TRUE.).

– "XEMISRADIUSJ" : Aerosol flux, mean radius of accumulation mode in $\mu m$ (only if LCH_AERO_FLUX=.TRUE.).

– "XEMISSIGI" : Aerosol flux, standard deviation of aitken mode in $\mu m$ (only if LCH_AERO_FLUX=.TRUE.).

– "XEMISSIGJ" : Aerosol flux, standard deviation of accumulation mode in $\mu m$ (only if LCH_AERO_FLUX=.TRUE.).

– "CRGUNIT" : Aerosol flux, Definition of XEMISRADIUSI or XEMISRADIUSJ : mean radius can be define in mass ("MASS") or in number ("NUMB").

## 5.8 Chemical deposition and biogenic emissions over vegetation

# Chapitre 6

# Externalized surface diagnostics

The diagnostics for the surface require the call to the complete physics of the surface. Therefore, they can be computed either during the run of the schemes (in order to have for example continuous time series of these diagnostics), or can be computed at a given instant only, if atmospheric forcing is given at this instant for the surface scheme to do one time step. The cumulated diagnostics are of course significant only when computed during a run.

## 6.1 Diagnostics relative to the general surface monitor

**Namelist NAM_DIAG_SURF_ATMn**

| Fortran name | Fortran type | default value |
|---|---|---|
| LFRAC | logical | .FALSE. |
| LDIAG_GRID | logical | .FALSE. |

- LFRAC : flag to save in the output file the sea, inland water, natural covers and town fractions.
- LDIAG_GRID : flag for mean grid diagnostics

## 6.2 Diagnostics relative to the general surface monitor and to each surface scheme

**Namelist NAM_DIAG_SURFn**

| Fortran name | Fortran type | values | default value |
|---|---|---|---|
| N2M | integer | 0, 1, 2 | 0 |
| LSURF_BUDGET | logical | | .FALSE. |
| LRAD_BUDGET | logical | | .FALSE. |
| LCOEF | logical | | .FALSE. |
| LSURF_VARS | logical | | .FALSE. |

- N2M : flag to compute surface boundary layer characteristics :
  - N2M=1 : computes temperature at 2 m, specific humidity at 2 m, relative humidity, zonal and meridian wind at 10 m, and Richardson number. 2m and 10m quantities are calculated extrapolating atmospheric forcing variables with Paulson laws using surface heat, water and momentum fluxes.
  - N2M=2 : computes temperature at 2 m, specific humidity at 2 m, relative humidity, zonal and meridian wind at 10 m, and Richardson number. 2m and 10m quantities are calculated interpolating between atmospheric forcing variables and surface temperature and humidity.
- LSURF_BUDGET : flag to save in the output file the terms of the surface energy balance (net radiation, sensible heat flux, latent heat flux, ground flux), for each scheme (on the four separate tiles), on each patch of the vegetation scheme if existing, and aggregated for the whole surface. The diagnosed fields are (∗ stands for the scheme considered (∗=nothing : field aggregated on the whole surface ; ∗=name of a scheme : field for this scheme) :
  - RN_∗ : net radiation
  - H_∗ : turbulent sensible heat flux
  - LE_∗ : turbulent latent heat flux
  - GFLUX_∗ : ground or storage heat flux
  - FMU_∗ : zonal wind stress
  - FMV_∗ : meridian wind stress

  If both LSURF_BUDGET and LRAD_BUDGET are T then downward and upward short-wave radiation per spectral band will be written into output file (they're computed even if LRAD_BUDGET is false). The following output fields are then available :
  - SWD_∗ : downward short wave radiation
  - SWU_∗ : upward short wave radiation
  - SWBD_∗ : downward short wave radiation for each spectral band
  - SWBU_∗ : upward short wave radiation for each spectral band

  - LWD_* : downward long wave radiation
  - LWU_* : upward long wave radiation
- LCOEF : flag to save in the output file the transfer coefficients used in the computation of the surface energy fluxes, for each scheme (on the four separate tiles) and aggregated for the whole surface. The diagnosed fields are (* stands for the scheme considered (*=nothing : field aggregated on the whole surface ; *=name of a scheme : field for this scheme) :
  - CD_* : drag coefficient for momentum
  - CH_* : drag coefficient for heat
  - CE_* : drag coefficient for evaporation (differs from CH only over sea)
  - Z0_* : roughness length
  - Z0H_* : thermal roughness length
- LSURF_VARS : flag to save in the output file the surface specific humidity for each scheme (on the four separate tiles), on each patch of the vegetation scheme if existing. The diagnosed fields are (* stands for the scheme considered (*=nothing : field aggregated on the whole surface ; *=name of a scheme : field for this scheme) :
  - QS_* : specific huidity

## 6.3 Diagnostics relative to the ISBA vegetation scheme

**Namelist NAM_DIAG_ISBAn**

| Fortran name | Fortran type | default value |
|---|---|---|
| LPGD | logical | .FALSE. |
| LPGD_FIX | logical | .FALSE. |
| LSURF_EVAP_BUDGET | logical | .FALSE. |
| LSURF_MISC_BUDGET | logical | .FALSE. |
| LSURF_BUDGETC | logical | .FALSE. |
| LRESET_BUDGETC | logical | .FALSE. |

- LPGD : flag to save in the output file the physiographic fields of ISBA scheme that are computed from ecoclimap data from the ecosystem fractions.
- LPGD_FIX : flag to save in the output file the physiographic fields of ISBA scheme that are computed from ecoclimap data from the ecosystem fractions and that does not vary in time.
- LSURF_EVAP_BUDGET : flag to save in the output file the detailed terms of the water vapor fluxes, on each patch of the vegetation scheme if existing, and aggregated for the natural surface. The diagnosed fields are :
- LSURF_MISC_BUDGET : flag to save in the output file miscelleaneous fields. The diagnosed fields are :
  - HV : Halstead coefficient
  - SNG : snow fraction over bare ground
  - SNV : snow fraction over vegetation
  - SN : total snow fraction
  - SWI : soil wetness index for each ground layer $(w_g - w_{wilt})/(w_{fc} - w_{wilt})$ where $w_g$ is the volumic water content, $w_{fc}$ is the porosity and $w_{wilt}$ corresponds to the plant wilting point.
  - GPP : Gross primary production
  - RDK : Dark respiration
- LSURF_BUDGETC : flag to save in the output file the time integrated values of all budget terms that have been activated (either with :LSURF_BUDGET flag in NAM_DIAG_SURFn or LSURF_EVAP_BUDGET in the present namelist).
- LRESET_BUDGETC : flag to reset cumulatives variables at the beginning of a run

## 6.4 Diagnostics relative to the TEB town scheme

**Namelist NAM_DIAG_TEBn**

| Fortran name | Fortran type | default value |
|---|---|---|
| LSURF_MISC_BUDGET | logical | .FALSE. |

– LSURF_MISC_BUDGET : flag to save in the output file miscelleaneous fields. The diagnosed fields are :
  – Z0_TOWN : roughness length for town
  – QF_BLD : domestic heating
  – QF_BLDWFR : domestic heating
  – FLX_BLD : heat flux from bld
  – TI_BLD_EQ : internal temperature without heating
  – TI_BLDWFR : internal temperature without heating
  – QF_TOWN : total anthropogenic heat
  – DQS_TOWN : storage inside building
  – H_WALL : wall sensible heat flux
  – H_ROOF : roof sensible heat flux
  – H_ROAD : road sensible heat flux
  – RN_WALL : net radiation at wall
  – RN_ROOF : net radiation at roof
  – RN_ROAD : net radiation at road
  – GFLUX_WALL : net wall conduction flux
  – GFLUX_ROOF : net roof conduction flux
  – GFLUX_ROAD : net road conduction flux
  – LE_ROOF : roof latent heat flux
  – LE_ROAD : road latent heat flux

## 6.5 Diagnostics relative to the FLAKE scheme

**Namelist NAM_DIAG_FLAKEn**

| Fortran name | Fortran type | default value |
|---|---|---|
| LWATER_PROFILE | logical | .FALSE. |
| XZWAT_PROFILE | real | |

– LWATER_PROFILE : flag to save in the output file miscelleaneous fields. The diagnosed fields are :
  – XZWAT_PROFILE : depth of output levels (m) in namelist

## 6.6 Diagnostics relative to the 1D oceanic scheme

**Namelist NAM_DIAG_OCEANn**

| Fortran name | Fortran type | default value |
|---|---|---|
| LDIAG_OCEAN | logical | .FALSE. |

– LDIAG_OCEAN : flag for ocean variables

# Chapitre 7

# Externalized surface model output fields

Model output fields depend on the tile and on the configuration of run.

## 7.1 Prognostic model output fields

### 7.1.1 ISBA

The definition of the representation of soil, vegetation, snow and surface boundary layer components is done during PGD and PREP. The description of soil is done with parameter CISBA (2 layers, 3 layers or more if diffusion treatment selected) from NAM_ISBA. The representation of vegetation is done with parameters NPATCH (number of patches over vegetation) and CPHOTO (type of photosynthesis). During PREP, the snow scheme is chosen by parameter CSNOW in NAM_PREP_ISBA and if the surface boundary layer (SBL) scheme is activated then LISBA_CANOPY key has to be set to T.

| | soil (CISBA) | | | | vegetation (CPHOTO) | | | snow (CSNOW) | | | SBL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| name | **layer** | 2-L | 3-L | DIF | AST/AGS | LAI/LST | NIT | **layer** | D95/EBA | DIF | **layer** 1 to 6 |
| TG | 1 | • | • | • | | | | | | | |
| | 2 | • | • | • | | | | | | | |
| | n≥3 | | | • | | | | | | | |
| WG | 1 | • | • | • | | | | | | | |
| | 2 | • | • | • | | | | | | | |
| | 3 | | • | • | | | | | | | |
| | n≥4 | | | • | | | | | | | |
| WGI | 1 | • | • | • | | | | | | | |
| | 2 | • | • | • | | | | | | | |
| | n≥3 | | | • | | | | | | | |
| WR | | • | • | • | | | | | | | |
| RESA | | • | • | • | | | | | | | |
| LAI | | | | | • | • | • | | | | |
| AN | | | | | • | • | • | | | | |
| ANDAY | | | | | • | • | • | | | | |
| ANFM | | | | | • | • | • | | | | |
| LE_AGS | | | | | • | • | • | | | | |
| RESPBSTR | | | | | | | • | | | | |
| RESPBSTR2 | | | | | | | • | | | | |
| BIOMASSTR2 | | | | | | | • | | | | |
| BIOMASSTR2_LAST | | | | | | | • | | | | |
| BIOMASSTR_LAST | | | | | | | • | | | | |
| WSNOW_VEG | | | | | | | | 1 | • | • | |
| | | | | | | | | 2 | | • | |
| | | | | | | | | 3 | | • | |
| RSNOW_VEG | | | | | | | | 1 | • | • | |
| | | | | | | | | 2 | | • | |
| | | | | | | | | 3 | | • | |
| HSNOW_VEG | | | | | | | | 1 | | • | |
| | | | | | | | | 2 | | • | |
| | | | | | | | | 3 | | • | |
| TSNOW_VEG | | | | | | | | 1 | • | | |
| ASNOW_VEG | | | | | | | | | • | • | |
| ISBA_CAN_U | | | | | | | | | | | • |
| ISBA_CAN_T | | | | | | | | | | | • |
| ISBA_CAN_Q | | | | | | | | | | | • |
| ISBA_CAN_E | | | | | | | | | | | • |
| ISBA_CAN_P | | | | | | | | | | | • |

| variable | dimension | unit | description |
|---|---|---|---|
| TG1 | [2D] | [K] | surface temperature |
| TG2 | [2D] | [K] | deep soil temperature |
| TG3 | [2D] | [K] | third layer temperature |
| WG1 | [2D] | [m3/m3] | surface liquid volumetric water content |
| WG2 | [2D] | [m3/m3] | root liquid volumetric water content |
| WG3 | [2D] | [m3/m3] | deep liquid volumetric water content |
| WGI1 | [2D] | [m3/m3] | surface frozen volumetric water content |
| WGI2 | [2D] | [m3/m3] | root frozen volumetric water content |
| WGI3 | [2D] | [m3/m3] | third layer frozen volumetric water content |
| WR | [2D] | [Kg/m2] | liquid water retained by the foliage |
| RESA | [2D] | [s/m] | aerodynamical resistance |
| LAI | [2D] | [m2/m2] | leaf area index |
| AN | [2D] | [kgCO2/m2/s] | CO2 net assimilation |
| ANDAY | [2D] | [kgCO2/m2] | daily CO2 net assimilation |
| ANFM | [2D] | [mg/m2/s] | maximum leaf assimilation |
| LE_AGS | [2D] | [W/m2] | latent heat flux |
| RESPBSTR | [2D] | [W/m2] | respiration of above-ground structural biomass |
| RESPBSTR2 | [2D] | [W/m2] | respiration of deep structural biomass |
| BIOMASSTR2 | [2D] | [Kg/m2] | total dry above-ground structural biomass |
| BIOMASSTR2_LAST | [2D] | [Kg/m2] | total dry below-ground structural biomass of day-1 |
| BIOMASSTR_LAST | [2D] | [Kg/m2] | total dry above-ground structural biomass of day-1 |
| TSNOW_VEG1 | [2D] | [K] | 1st layer snow temperature |
| WSNOW_VEG1 | [2D] | [Kg/m2] | 1st layer snow water equivalent |
| RSNOW_VEG1 | [2D] | [Kg/m3] | 1st layer snow density |
| HSNOW_VEG1 | [2D] | [W/m2] | 1st layer snow heat content |
| ASNOW_VEG | [2D] | [-] | snow albedo |
| WSNOW_VEG2 | [2D] | [Kg/m2] | 2nd layer snow water equivalent |
| RSNOW_VEG2 | [2D] | [Kg/m3] | 2nd layer snow density |
| HSNOW_VEG2 | [2D] | [W/m2] | 2nd layer snow heat content |
| WSNOW_VEG3 | [2D] | [Kg/m2] | 3rd layer snow water equivalent |
| RSNOW_VEG3 | [2D] | [Kg/m3] | 3rd layer snow density |
| HSNOW_VEG3 | [2D] | [W/m2] | 3rd layer snow heat content |
| ISBA_CAN_Un | [1D] | [m/s] | wind in canopy at layer n (n=1 to 6) |
| ISBA_CAN_Tn | [1D] | [m/s] | temperature in canopy at layer n (n=1 to 6) |
| ISBA_CAN_Qn | [1D] | [m/s] | humidity in canopy at layer n (n=1 to 6) |
| ISBA_CAN_En | [1D] | [m/s] | TKE in canopy at layer n (n=1 to 6) |
| ISBA_CAN_Pn | [1D] | [m/s] | pressure in canopy at layer n (n=1 to 6) |

### 7.1.2 SEAFLUX

| | SEAFLUX | SBL |
|---|---|---|
| SST | • | |
| Z0SEA | • | |
| SEA_SBL_U | | • |
| SEA_SBL_T | | • |
| SEA_SBL_Q | | • |
| SEA_SBL_E | | • |
| SEA_SBL_P | | • |

### 7.1.3 TEB

| | Standard TEB | | CANOPY |
|---|---|---|---|
| name | **layer** | | |
| T_ROOF | 1 | • | |
| | 2 | • | |
| | 3 | • | |
| WS_ROOF | | • | |
| T_ROAD | 1 | • | |
| | 2 | • | |
| | 3 | • | |
| WS_ROAD | | • | |
| T_WALL | 1 | • | |
| | 2 | • | |
| | 3 | • | |
| TI_BLD | | • | |
| TI_ROAD | | • | |
| WSNOW_ROOF | 1 | • | |
| RSNOW_ROOF | 1 | • | |
| TSNOW_ROOF | 1 | • | |
| ASNOW_ROOF | | • | |
| WSNOW_ROAD | 1 | • | |
| RSNOW_ROAD | 1 | • | |
| TSNOW_ROAD | 1 | • | |
| ASNOW_ROAD | | • | |
| T_CANYON | | • | |
| Q_CANYON | | • | |
| TEB_CAN_U | | | • |
| TEB_CAN_T | | | • |
| TEB_CAN_Q | | | • |
| TEB_CAN_E | | | • |
| TEB_CAN_P | | | • |

### 7.1.4 WATFLUX

| | WATERFLUX | SBL |
|---|---|---|
| TS_WATER | • | |
| Z0WATER | • | |
| WAT_SBL_U | | • |
| WAT_SBL_T | | • |
| WAT_SBL_Q | | • |
| WAT_SBL_E | | • |
| WAT_SBL_P | | • |

### 7.1.5 FLAKE

| | FLAKE | SBL |
|---|---|---|
| TS_WATER | • | |
| T_SNOW | • | |
| T_ICE | • | |
| T_MNW | • | |
| T_WML | • | |
| T_BOT | • | |
| T_B1 | • | |
| CT | • | |
| H_SNOW | • | |
| H_ICE | • | |
| H_ML | • | |
| H_B1 | • | |
| WAT_SBL_U | | • |
| WAT_SBL_T | | • |
| WAT_SBL_Q | | • |
| WAT_SBL_E | | • |
| WAT_SBL_P | | • |

# Annexe A

# Example of namelist features

## A.1 How to define a target grid

```
&NAM_PGDFILE          CPGDFILE='PGDFILE.2.5km_AROME_FRANCE'
/
&NAM_PGD_GRID         CGRID = 'CONF PROJ '
/
&NAM_CONF_PROJ        XLAT0=46.401460686331625,
                      XLON0=2.2000000000000273,
                      XRPK=0.7241894422,
                      XBETA=0.00
/
&NAM_CONF_PROJ_GRID   XLATCEN=46.401460686331625,
                      XLONCEN=2.2000000000000273,
                      NIMAX=588, NJMAX=500,
                      XDX=2499.7648911167489,
                      XDY=2499.7648911167489
/
```

## A.2 How to use ECOCLIMAP I

This is the classical way how to use ecoclimap and other databases (orography, sand and clay). In previous version, the name of ecoclimap database was ecoclimats_v2, it has been replaced by ECOCLIMAP_I_GLOBAL.

```
&NAM_FRAC              LECOCLIMAP = T
/
&NAM_COVER             YCOVER    = 'ECOCLIMAP_I_GLOBAL'    ,
                       YFILETYPE = 'DIRECT'
/
&NAM_ZS                YZS       = 'gtopo30'          ,
                       YFILETYPE = 'DIRECT'
/
&NAM_ISBA              YCLAY         = 'clay_fao'     ,
                       YCLAYFILETYPE = 'DIRECT'       ,
                       YSAND         = 'sand_fao'     ,
                       YSANDFILETYPE = 'DIRECT'       ,
                       CISBA         = '3-L'          ,
                       CPHOTO        = 'NON'          ,
                       NPATCH        = 1              ,
                       NGROUND_LAYER = 3
/
```

## A.3 How to use ECOCLIMAP II

```
&NAM_FRAC             LECOCLIMAP = T
/
&NAM_COVER            YCOVER     = 'ECOCLIMAP_II_EUROP'              ,
                      YFILETYPE  = 'DIRECT'                          ,
/
```

## A.4 How to use 1D Oceanic Model

```
&NAM_SEABATHY         YSEABATHY         = 'etopo2.nc',
                      YSEABATHYFILETYPE = 'NETCDF',
                      YNCVARNAME        = 'topo'
/
&NAM_PREP_SEAFLUX     CFILE_SEAFLX    = 'mercator_20031203.nc',
                      CTYPE           = 'NETCDF',
                      LOCEAN_MERCATOR = T,
                      LOCEAN_CURRENT  = F
/
&NAM_SEAFLUXn         CSEA_ALB = "TA96" ,
                      LPROGSST = T
/
```

## A.5 How to initialize variables from grib file

```
&NAM_PREP_SURF_ATM    CFILE        = 'arpifs.AN.20030101.00' ,
                      CFILETYPE    = 'GRIB  '
/
&NAM_PREP_TEB         CFILE_TEB    = 'arpifs.AN.20030101.00' ,
                      CTYPE        = 'GRIB  '
/
&NAM_PREP_SEAFLUX     CFILE_SEAFLX = 'arpifs.AN.20030101.00' ,
                      CTYPE        = 'GRIB  '
/
&NAM_PREP_WATFLUX     CFILE_WATFLX = 'arpifs.AN.20030101.00' ,
                      CTYPE        = 'GRIB  '
/
&NAM_PREP_ISBA        CFILE_ISBA   = 'arpifs.AN.20030101.00' ,
                      CTYPE        = 'GRIB  '
/
&NAM_PREP_ISBA_SNOW   CSNOW = '3-L'
/
```

## A.6 How to initialize main ISBA scheme options

```
&NAM_SGH_ISBAn        CRUNOFF    = "WSAT"
/
&NAM_ISBAn            CROUGH     = "Z04D"     ,
                      CSCOND     = "NP89"     ,
                      CALBEDO    = "DRY"      ,
                      CC1DRY     = 'DEF '     ,
                      CSOILFRZ   = 'DEF'      ,
                      CDIFSFCOND = 'DEF '     ,
                      CCPSURF    = 'DRY'      ,
                      CSNOWRES   = 'DEF'
/
&NAM_CH_ISBAn         CCH_DRY_DEP = "WES89 "
/
```

## A.7 user defined surface parameters

Ecoclimap is not used (LECOCLIMAP = F). Information is not read from databases but the usern defines his own surface parameters. Uniform field is used in this 1D case.

### A.7.1 Uniform values prescribed : 1d example without patches

```
&NAM_DATA_ISBA        NTIME = 12 ,
                      XUNIF_VEGTYPE(1)     = 0.,
                      XUNIF_VEGTYPE(2)     = 0.,
                      XUNIF_VEGTYPE(3)     = 0.,
                      XUNIF_VEGTYPE(4)     = 0.,
                      XUNIF_VEGTYPE(5)     = 1.,
```

```
XUNIF_VEGTYPE(6)     = 0.,
XUNIF_VEGTYPE(7)     = 0.,
XUNIF_VEGTYPE(8)     = 0.,
XUNIF_VEGTYPE(9)     = 0.,
XUNIF_VEGTYPE(10)    = 0.,
XUNIF_VEGTYPE(11)    = 0.,
XUNIF_VEGTYPE(12)    = 0.,
XUNIF_VEG(1,1)       = 1.,
XUNIF_VEG(1,2)       = 1.,
XUNIF_VEG(1,3)       = 1.,
XUNIF_VEG(1,4)       = 1.,
XUNIF_VEG(1,5)       = 1.,
XUNIF_VEG(1,6)       = 1.,
XUNIF_VEG(1,7)       = 1.,
XUNIF_VEG(1,8)       = 1.,
XUNIF_VEG(1,9)       = 1.,
XUNIF_VEG(1,10)      = 1.,
XUNIF_VEG(1,11)      = 1.,
XUNIF_VEG(1,12)      = 1.,
XUNIF_LAI(1,1)       = 0.789,
XUNIF_LAI(1,2)       = 0.213,
XUNIF_LAI(1,3)       = 0.345,
XUNIF_LAI(1,4)       = 0.467,
XUNIF_LAI(1,5)       = 0.888,
XUNIF_LAI(1,6)       = 0.621,
XUNIF_LAI(1,7)       = 0.743,
XUNIF_LAI(1,8)       = 0.855,
XUNIF_LAI(1,9)       = 0.976,
XUNIF_LAI(1,10)      = 0.123,
XUNIF_LAI(1,11)      = 0.134,
XUNIF_LAI(1,12)      = 0.155,
XUNIF_Z0(1,1)        = 2.5,
XUNIF_Z0(1,2)        = 2.5,
XUNIF_Z0(1,3)        = 2.5,
XUNIF_Z0(1,4)        = 2.5,
XUNIF_Z0(1,5)        = 2.5,
XUNIF_Z0(1,6)        = 2.5,
XUNIF_Z0(1,7)        = 2.5,
XUNIF_Z0(1,8)        = 2.5,
XUNIF_Z0(1,9)        = 2.5,
XUNIF_Z0(1,10)       = 2.5,
XUNIF_Z0(1,11)       = 2.5,
XUNIF_Z0(1,12)       = 2.5,
XUNIF_EMIS(1,1)      = 0.97,
XUNIF_EMIS(1,2)      = 0.97,
XUNIF_EMIS(1,3)      = 0.97,
XUNIF_EMIS(1,4)      = 0.97,
XUNIF_EMIS(1,5)      = 0.97,
XUNIF_EMIS(1,6)      = 0.97,
XUNIF_EMIS(1,7)      = 0.97,
XUNIF_EMIS(1,8)      = 0.97,
XUNIF_EMIS(1,9)      = 0.97,
XUNIF_EMIS(1,10)     = 0.97,
XUNIF_EMIS(1,11)     = 0.97,
XUNIF_EMIS(1,12)     = 0.97,
XUNIF_DG(1,1)        = 0.01,
XUNIF_DG(1,2)        = 0.70,
XUNIF_DG(1,3)        = 1.30,
XUNIF_ROOTFRAC(1,1)  = -999.,
XUNIF_ROOTFRAC(1,2)  = -999.,
XUNIF_ROOTFRAC(1,3)  = -999.,
XUNIF_RSMIN(1)       = 150.,
XUNIF_GAMMA(1)       = 0.04,
XUNIF_WRMAX_CF(1)    = 0.1,
XUNIF_RGL(1)         = 30.,
XUNIF_CV(1)          = 0.00001,
XUNIF_Z0_O_Z0H(1)    = 10.,
XUNIF_ALBNIR_VEG(1)  = 0.15,
```

```
                       XUNIF_ALBVIS_VEG(1)  = 0.05,
                       XUNIF_ALBUV_VEG(1)   = 0.0425,
                       XUNIF_ALBNIR_SOIL(1) = 0.15,
                       XUNIF_ALBVIS_SOIL(1) = 0.05,
                       XUNIF_ALBUV_SOIL(1)  = 0.0425,
                       XUNIF_GMES(1)        = 0.001,
                       XUNIF_RE25(1)        = 0.00000015,
                       XUNIF_BSLAI(1)       = 0.25,
                       XUNIF_LAIMIN(1)      = 1.0,
                       XUNIF_SEFOLD(1)      = 31536000.,
                       XUNIF_GC(1)          = 0.,
                       XUNIF_DMAX(1)        = 0.1,
                       XUNIF_F2I(1)         = 0.3,
                       XUNIF_H_TREE(1)      = 20.,
                       XUNIF_CE_NITRO(1)    = 4.85,
                       XUNIF_CF_NITRO(1)    = -0.24,
                       XUNIF_CNA_NITRO(1)   = 2.8,
/
&NAM_DATA_TEB          NROOF_LAYER      = 3,
                       XUNIF_ALB_ROOF   = 0.2,
                       XUNIF_EMIS_ROOF  = 0.97,
                       XUNIF_HC_ROOF(1) = 2110000.,
                       XUNIF_HC_ROOF(2) = 2800000.,
                       XUNIF_HC_ROOF(3) = 2900000.,
                       XUNIF_TC_ROOF(1) = 1.51,
                       XUNIF_TC_ROOF(2) = 0.08,
                       XUNIF_TC_ROOF(3) = 0.05,
                       XUNIF_D_ROOF(1)  = 0.05,
                       XUNIF_D_ROOF(2)  = 0.4,
                       XUNIF_D_ROOF(3)  = 0.1,
                       NROAD_LAYER      = 3,
                       XUNIF_ALB_ROAD   = 0.2,
                       XUNIF_EMIS_ROAD  = 0.97,
                       XUNIF_HC_ROAD(1) = 2110000.,
                       XUNIF_HC_ROAD(2) = 2800000.,
                       XUNIF_HC_ROAD(3) = 2900000.,
                       XUNIF_TC_ROAD(1) = 1.51,
                       XUNIF_TC_ROAD(2) = 0.08,
                       XUNIF_TC_ROAD(3) = 0.05,
                       XUNIF_D_ROAD(1)  = 0.05,
                       XUNIF_D_ROAD(2)  = 0.4,
                       XUNIF_D_ROAD(3)  = 0.1,
                       NWALL_LAYER      = 3,
                       XUNIF_ALB_WALL   = 0.2,
                       XUNIF_EMIS_WALL  = 0.97,
                       XUNIF_HC_WALL(1) = 2110000.,
                       XUNIF_HC_WALL(2) = 2800000.,
                       XUNIF_HC_WALL(3) = 2900000.,
                       XUNIF_TC_WALL(1) = 1.51,
                       XUNIF_TC_WALL(2) = 0.08,
                       XUNIF_TC_WALL(3) = 0.05,
                       XUNIF_D_WALL(1)  = 0.05,
                       XUNIF_D_WALL(2)  = 0.4,
                       XUNIF_D_WALL(3)  = 0.1,
                       XUNIF_Z0_TOWN    = 1.,
                       XUNIF_BLD        = 0.5,
                       XUNIF_BLD_HEIGHT = 10.,
                       XUNIF_WALL_O_HOR = 0.5,
                       XUNIF_H_TRAFFIC  = 10.,
                       XUNIF_LE_TRAFFIC = 0.,
                       XUNIF_H_INDUSTRY = 5.,
                       XUNIF_LE_INDUSTRY= 0.
/
&NAM_FRAC              LECOCLIMAP = F,
                       XUNIF_SEA    = 0.,
                       XUNIF_WATER  = 0.5,
                       XUNIF_TOWN   = 0.,
                       XUNIF_NATURE = 0.5
```

```
/
&NAM_PGD_GRID          CGRID = 'LONLAT REG'
/
&NAM_LONLAT_REG        XLONMIN = 0.           ,
                       XLONMAX = 0.           ,
                       XLATMIN = 0.          ,
                       XLATMAX = 0.          ,
                       NLON    = 1            ,
                       NLAT    = 1
/
&NAM_PGD_SCHEMES       CNATURE = 'ISBA  '    ,
                       CSEA    = 'SEAFLX'    ,
                       CTOWN   = 'TEB   '    ,
                       CWATER  = 'WATFLX'
/
&NAM_ZS                XUNIF_ZS  = 0.
/
&NAM_ISBA              XUNIF_CLAY    = 0.4           ,
                       XUNIF_SAND    = 0.2           ,
                       XUNIF_RUNOFFB = 0.5           ,
                       CISBA         = '3-L'         ,
                       CPHOTO        = 'NON'         ,
                       NPATCH        = 1             ,
                       NGROUND_LAYER = 3
/

&NAM_PREPFILE          CPREPFILE = 'PREP'
/
&NAM_PREP_SURF_ATM NYEAR  = 2004,
                   NMONTH = 10,
                   NDAY   = 25,
                   XTIME  = 21600.
/
&NAM_PREP_SEAFLUX  XSST_UNIF = 285.,
                   NYEAR  = 2004,
                   NMONTH = 10,
                   NDAY   = 25,
                   XTIME  = 21600.
/
&NAM_PREP_WATFLUX  XTS_WATER_UNIF = 285.,
                   NYEAR  = 2004,
                   NMONTH = 10,
                   NDAY   = 25,
                   XTIME  = 21600.
/
&NAM_PREP_TEB      XTI_ROAD= 285.,
                   XTI_BLD = 285.
                   XTS_ROAD= 285.
                   XTS_ROOF= 285.,
                   XTS_WALL= 285.,
                   XWS_ROAD= 0.,
                   XWS_ROOF= 0.,
                   NYEAR  = 2004,
                   NMONTH = 10,
                   NDAY   = 25,
                   XTIME  = 21600.
/
&NAM_PREP_ISBA     XHUG_SURF = 0.2,
                   XHUG_ROOT = 0.2,
                   XHUG_DEEP = 0.2,
                   XTG_SURF  = 285.,
                   XTG_ROOT  = 288.,
                   XTG_DEEP  = 292.
                   NYEAR  = 2004,
                   NMONTH = 10,
                   NDAY   = 25,
                   XTIME  = 21600.
/
```

```
&NAM_PREP_ISBA_SNOW    CSNOW = '3-L'
/


&NAM_IO_OFFLINE        LPRINT  = T                          ,
                       CFORCING_FILETYPE =    'NETCDF'    ,
                       CSURF_FILETYPE =       'LFI   '    ,
                       CTIMESERIES_FILETYPE = 'NETCDF'    ,
                       LWRITE_COORD = T,
                       LSET_FORC_ZS=T
/


&NAM_DIAG_SURFn        LSURF_BUDGET = T      ,
                       N2M          = 1
/
&NAM_DIAG_SURF_ATMn    LFRAC        = T
/
&NAM_DIAG_ISBAn        LPGD              = T ,
                       LSURF_EVAP_BUDGET = T ,
                       LSURF_MISC_BUDGET = T ,
                       LSURF_BUDGETC     = F
/
&NAM_DIAG_TEBn         LSURF_MISC_BUDGET = T
/
&NAM_SGH_ISBAn         CRUNOFF    = "WSAT"
/
&NAM_ISBAn             CROUGH     = "Z04D"     ,
                       CSCOND     = "NP89"     ,
                       CALBEDO    = "DRY"      ,
                       CC1DRY     = 'DEF '     ,
                       CSOILFRZ   = 'DEF'      ,
                       CDIFSFCOND = 'DEF '     ,
                       CSNOWRES   = 'DEF'      ,
                       CCPSURF    = 'DRY'
/
&NAM_CH_ISBAn          CCH_DRY_DEP = "WES89 "
/
&NAM_SEAFLUXn          CSEA_ALB = "TA96"
/
&NAM_CH_SEAFLUXn       CCH_DRY_DEP = "WES89 "
/
&NAM_CH_WATFLUXn       CCH_DRY_DEP = "WES89 "
/
&NAM_CH_TEBn           CCH_DRY_DEP = "WES89 "
/
```

### A.7.2 Uniform values prescribed : 1d example with patches

```
&NAM_DATA_ISBA         NTIME = 12 ,
                       XUNIF_VEGTYPE(1)     = 0.,
                       XUNIF_VEGTYPE(2)     = 0.,
                       XUNIF_VEGTYPE(3)     = 0.,
                       XUNIF_VEGTYPE(4)     = 0.,
                       XUNIF_VEGTYPE(5)     = 0.,
                       XUNIF_VEGTYPE(6)     = 0.,
                       XUNIF_VEGTYPE(7)     = 1.,
                       XUNIF_VEGTYPE(8)     = 0.,
                       XUNIF_VEGTYPE(9)     = 0.,
                       XUNIF_VEGTYPE(10)    = 0.,
                       XUNIF_VEGTYPE(11)    = 0.,
                       XUNIF_VEGTYPE(12)    = 0.,
                       XUNIF_VEG (1,1)      = 0.,      XUNIF_VEG (5,1)      = 0.,      XUNIF_VEG (9,1)      = 0.,
                       XUNIF_VEG (1,2)      = 0.,      XUNIF_VEG (5,2)      = 0.,      XUNIF_VEG (9,2)      = 0.,
                       XUNIF_VEG (1,3)      = 0.,      XUNIF_VEG (5,3)      = 0.,      XUNIF_VEG (9,3)      = 0.,
                       XUNIF_VEG (1,4)      = 0.,      XUNIF_VEG (5,4)      = 0.,      XUNIF_VEG (9,4)      = 0.,
                       XUNIF_VEG (1,5)      = 0.5,     XUNIF_VEG (5,5)      = 0.5,     XUNIF_VEG (9,5)      = 0.5,
                       XUNIF_VEG (1,6)      = 0.9,     XUNIF_VEG (5,6)      = 0.9,     XUNIF_VEG (9,6)      = 0.9,
```

```
XUNIF_VEG (1,7)      = 0.9,     XUNIF_VEG (5,7)      = 0.9,     XUNIF_VEG (9,7)      = 0.9,
XUNIF_VEG (1,8)      = 0.9,     XUNIF_VEG (5,8)      = 0.9,     XUNIF_VEG (9,8)      = 0.9,
XUNIF_VEG (1,9)      = 0.9,     XUNIF_VEG (5,9)      = 0.9,     XUNIF_VEG (9,9)      = 0.9,
XUNIF_VEG (1,10)     = 0.,      XUNIF_VEG (5,10)     = 0.,      XUNIF_VEG (9,10)     = 0.,
XUNIF_VEG (1,11)     = 0.,      XUNIF_VEG (5,11)     = 0.,      XUNIF_VEG (9,11)     = 0.,
XUNIF_VEG (1,12)     = 0.,      XUNIF_VEG (5,12)     = 0.,      XUNIF_VEG (9,12)     = 0.,
XUNIF_LAI (1,1)      = 0.,      XUNIF_LAI (5,1)      = 0.,      XUNIF_LAI (9,1)      = 0.,
XUNIF_LAI (1,2)      = 0.,      XUNIF_LAI (5,2)      = 0.,      XUNIF_LAI (9,2)      = 0.,
XUNIF_LAI (1,3)      = 0.,      XUNIF_LAI (5,3)      = 0.,      XUNIF_LAI (9,3)      = 0.,
XUNIF_LAI (1,4)      = 0.,      XUNIF_LAI (5,4)      = 0.,      XUNIF_LAI (9,4)      = 0.,
XUNIF_LAI (1,5)      = 1.,      XUNIF_LAI (5,5)      = 1.,      XUNIF_LAI (9,5)      = 1.,
XUNIF_LAI (1,6)      = 3.,      XUNIF_LAI (5,6)      = 3.,      XUNIF_LAI (9,6)      = 3.,
XUNIF_LAI (1,7)      = 3.,      XUNIF_LAI (5,7)      = 3.,      XUNIF_LAI (9,7)      = 3.,
XUNIF_LAI (1,8)      = 3.,      XUNIF_LAI (5,8)      = 3.,      XUNIF_LAI (9,8)      = 3.,
XUNIF_LAI (1,9)      = 3.,      XUNIF_LAI (5,9)      = 3.,      XUNIF_LAI (9,9)      = 3.,
XUNIF_LAI (1,10)     = 0.,      XUNIF_LAI (5,10)     = 0.,      XUNIF_LAI (9,10)     = 0.,
XUNIF_LAI (1,11)     = 0.,      XUNIF_LAI (5,11)     = 0.,      XUNIF_LAI (9,11)     = 0.,
XUNIF_LAI (1,12)     = 0.,      XUNIF_LAI (5,12)     = 0.,      XUNIF_LAI (9,12)     = 0.,
XUNIF_Z0  (1,1)      = 0.01,    XUNIF_Z0  (5,1)      = 0.01,    XUNIF_Z0  (9,1)      = 0.01,
XUNIF_Z0  (1,2)      = 0.01,    XUNIF_Z0  (5,2)      = 0.01,    XUNIF_Z0  (9,2)      = 0.01,
XUNIF_Z0  (1,3)      = 0.01,    XUNIF_Z0  (5,3)      = 0.01,    XUNIF_Z0  (9,3)      = 0.01,
XUNIF_Z0  (1,4)      = 0.01,    XUNIF_Z0  (5,4)      = 0.01,    XUNIF_Z0  (9,4)      = 0.01,
XUNIF_Z0  (1,5)      = 0.05,    XUNIF_Z0  (5,5)      = 0.05,    XUNIF_Z0  (9,5)      = 0.05,
XUNIF_Z0  (1,6)      = 0.15,    XUNIF_Z0  (5,6)      = 0.15,    XUNIF_Z0  (9,6)      = 0.15,
XUNIF_Z0  (1,7)      = 0.15,    XUNIF_Z0  (5,7)      = 0.15,    XUNIF_Z0  (9,7)      = 0.15,
XUNIF_Z0  (1,8)      = 0.15,    XUNIF_Z0  (5,8)      = 0.15,    XUNIF_Z0  (9,8)      = 0.15,
XUNIF_Z0  (1,9)      = 0.15,    XUNIF_Z0  (5,9)      = 0.15,    XUNIF_Z0  (9,9)      = 0.15,
XUNIF_Z0  (1,10)     = 0.01,    XUNIF_Z0  (5,10)     = 0.01,    XUNIF_Z0  (9,10)     = 0.01,
XUNIF_Z0  (1,11)     = 0.01,    XUNIF_Z0  (5,11)     = 0.01,    XUNIF_Z0  (9,11)     = 0.01,
XUNIF_Z0  (1,12)     = 0.01,    XUNIF_Z0  (5,12)     = 0.01,    XUNIF_Z0  (9,12)     = 0.01,
XUNIF_EMIS(1,1)      = 0.98,    XUNIF_EMIS(5,1)      = 0.98,    XUNIF_EMIS(9,1)      = 0.98,
XUNIF_EMIS(1,2)      = 0.98,    XUNIF_EMIS(5,2)      = 0.98,    XUNIF_EMIS(9,2)      = 0.98,
XUNIF_EMIS(1,3)      = 0.98,    XUNIF_EMIS(5,3)      = 0.98,    XUNIF_EMIS(9,3)      = 0.98,
XUNIF_EMIS(1,4)      = 0.98,    XUNIF_EMIS(5,4)      = 0.98,    XUNIF_EMIS(9,4)      = 0.98,
XUNIF_EMIS(1,5)      = 0.98,    XUNIF_EMIS(5,5)      = 0.98,    XUNIF_EMIS(9,5)      = 0.98,
XUNIF_EMIS(1,6)      = 0.98,    XUNIF_EMIS(5,6)      = 0.98,    XUNIF_EMIS(9,6)      = 0.98,
XUNIF_EMIS(1,7)      = 0.98,    XUNIF_EMIS(5,7)      = 0.98,    XUNIF_EMIS(9,7)      = 0.98,
XUNIF_EMIS(1,8)      = 0.98,    XUNIF_EMIS(5,8)      = 0.98,    XUNIF_EMIS(9,8)      = 0.98,
XUNIF_EMIS(1,9)      = 0.98,    XUNIF_EMIS(5,9)      = 0.98,    XUNIF_EMIS(9,9)      = 0.98,
XUNIF_EMIS(1,10)     = 0.98,    XUNIF_EMIS(5,10)     = 0.98,    XUNIF_EMIS(9,10)     = 0.98,
XUNIF_EMIS(1,11)     = 0.98,    XUNIF_EMIS(5,11)     = 0.98,    XUNIF_EMIS(9,11)     = 0.98,
XUNIF_EMIS(1,12)     = 0.98,    XUNIF_EMIS(5,12)     = 0.98,    XUNIF_EMIS(9,12)     = 0.98,
XUNIF_VEG (2,1)      = 0.,      XUNIF_VEG (6,1)      = 0.,      XUNIF_VEG (10,1)      = 0.,
XUNIF_VEG (2,2)      = 0.,      XUNIF_VEG (6,2)      = 0.,      XUNIF_VEG (10,2)      = 0.,
XUNIF_VEG (2,3)      = 0.,      XUNIF_VEG (6,3)      = 0.,      XUNIF_VEG (10,3)      = 0.,
XUNIF_VEG (2,4)      = 0.,      XUNIF_VEG (6,4)      = 0.,      XUNIF_VEG (10,4)      = 0.,
XUNIF_VEG (2,5)      = 0.5,     XUNIF_VEG (6,5)      = 0.5,     XUNIF_VEG (10,5)      = 0.5,
XUNIF_VEG (2,6)      = 0.9,     XUNIF_VEG (6,6)      = 0.9,     XUNIF_VEG (10,6)      = 0.9,
XUNIF_VEG (2,7)      = 0.9,     XUNIF_VEG (6,7)      = 0.9,     XUNIF_VEG (10,7)      = 0.9,
XUNIF_VEG (2,8)      = 0.9,     XUNIF_VEG (6,8)      = 0.9,     XUNIF_VEG (10,8)      = 0.9,
XUNIF_VEG (2,9)      = 0.9,     XUNIF_VEG (6,9)      = 0.9,     XUNIF_VEG (10,9)      = 0.9,
XUNIF_VEG (2,10)     = 0.,      XUNIF_VEG (6,10)     = 0.,      XUNIF_VEG (10,10)     = 0.,
XUNIF_VEG (2,11)     = 0.,      XUNIF_VEG (6,11)     = 0.,      XUNIF_VEG (10,11)     = 0.,
XUNIF_VEG (2,12)     = 0.,      XUNIF_VEG (6,12)     = 0.,      XUNIF_VEG (10,12)     = 0.,
XUNIF_LAI (2,1)      = 0.,      XUNIF_LAI (6,1)      = 0.,      XUNIF_LAI (10,1)      = 0.,
XUNIF_LAI (2,2)      = 0.,      XUNIF_LAI (6,2)      = 0.,      XUNIF_LAI (10,2)      = 0.,
XUNIF_LAI (2,3)      = 0.,      XUNIF_LAI (6,3)      = 0.,      XUNIF_LAI (10,3)      = 0.,
XUNIF_LAI (2,4)      = 0.,      XUNIF_LAI (6,4)      = 0.,      XUNIF_LAI (10,4)      = 0.,
XUNIF_LAI (2,5)      = 1.,      XUNIF_LAI (6,5)      = 1.,      XUNIF_LAI (10,5)      = 1.,
XUNIF_LAI (2,6)      = 3.,      XUNIF_LAI (6,6)      = 3.,      XUNIF_LAI (10,6)      = 3.,
XUNIF_LAI (2,7)      = 3.,      XUNIF_LAI (6,7)      = 3.,      XUNIF_LAI (10,7)      = 3.,
XUNIF_LAI (2,8)      = 3.,      XUNIF_LAI (6,8)      = 3.,      XUNIF_LAI (10,8)      = 3.,
XUNIF_LAI (2,9)      = 3.,      XUNIF_LAI (6,9)      = 3.,      XUNIF_LAI (10,9)      = 3.,
XUNIF_LAI (2,10)     = 0.,      XUNIF_LAI (6,10)     = 0.,      XUNIF_LAI (10,10)     = 0.,
XUNIF_LAI (2,11)     = 0.,      XUNIF_LAI (6,11)     = 0.,      XUNIF_LAI (10,11)     = 0.,
XUNIF_LAI (2,12)     = 0.,      XUNIF_LAI (6,12)     = 0.,      XUNIF_LAI (10,12)     = 0.,
XUNIF_Z0  (2,1)      = 0.01,    XUNIF_Z0  (6,1)      = 0.01,    XUNIF_Z0  (10,1)      = 0.01,
XUNIF_Z0  (2,2)      = 0.01,    XUNIF_Z0  (6,2)      = 0.01,    XUNIF_Z0  (10,2)      = 0.01,
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XUNIF_ZO  (2,3)      = 0.01,    XUNIF_ZO  (6,3)      = 0.01,    XUNIF_ZO  (10,3)      = 0.01,
XUNIF_ZO  (2,4)      = 0.01,    XUNIF_ZO  (6,4)      = 0.01,    XUNIF_ZO  (10,4)      = 0.01,
XUNIF_ZO  (2,5)      = 0.05,    XUNIF_ZO  (6,5)      = 0.05,    XUNIF_ZO  (10,5)      = 0.05,
XUNIF_ZO  (2,6)      = 0.15,    XUNIF_ZO  (6,6)      = 0.15,    XUNIF_ZO  (10,6)      = 0.15,
XUNIF_ZO  (2,7)      = 0.15,    XUNIF_ZO  (6,7)      = 0.15,    XUNIF_ZO  (10,7)      = 0.15,
XUNIF_ZO  (2,8)      = 0.15,    XUNIF_ZO  (6,8)      = 0.15,    XUNIF_ZO  (10,8)      = 0.15,
XUNIF_ZO  (2,9)      = 0.15,    XUNIF_ZO  (6,9)      = 0.15,    XUNIF_ZO  (10,9)      = 0.15,
XUNIF_ZO  (2,10)     = 0.01,    XUNIF_ZO  (6,10)     = 0.01,    XUNIF_ZO  (10,10)     = 0.01,
XUNIF_ZO  (2,11)     = 0.01,    XUNIF_ZO  (6,11)     = 0.01,    XUNIF_ZO  (10,11)     = 0.01,
XUNIF_ZO  (2,12)     = 0.01,    XUNIF_ZO  (6,12)     = 0.01,    XUNIF_ZO  (10,12)     = 0.01,
XUNIF_EMIS(2,1)      = 0.98,    XUNIF_EMIS(6,1)      = 0.98,    XUNIF_EMIS(10,1)      = 0.98,
XUNIF_EMIS(2,2)      = 0.98,    XUNIF_EMIS(6,2)      = 0.98,    XUNIF_EMIS(10,2)      = 0.98,
XUNIF_EMIS(2,3)      = 0.98,    XUNIF_EMIS(6,3)      = 0.98,    XUNIF_EMIS(10,3)      = 0.98,
XUNIF_EMIS(2,4)      = 0.98,    XUNIF_EMIS(6,4)      = 0.98,    XUNIF_EMIS(10,4)      = 0.98,
XUNIF_EMIS(2,5)      = 0.98,    XUNIF_EMIS(6,5)      = 0.98,    XUNIF_EMIS(10,5)      = 0.98,
XUNIF_EMIS(2,6)      = 0.98,    XUNIF_EMIS(6,6)      = 0.98,    XUNIF_EMIS(10,6)      = 0.98,
XUNIF_EMIS(2,7)      = 0.98,    XUNIF_EMIS(6,7)      = 0.98,    XUNIF_EMIS(10,7)      = 0.98,
XUNIF_EMIS(2,8)      = 0.98,    XUNIF_EMIS(6,8)      = 0.98,    XUNIF_EMIS(10,8)      = 0.98,
XUNIF_EMIS(2,9)      = 0.98,    XUNIF_EMIS(6,9)      = 0.98,    XUNIF_EMIS(10,9)      = 0.98,
XUNIF_EMIS(2,10)     = 0.98,    XUNIF_EMIS(6,10)     = 0.98,    XUNIF_EMIS(10,10)     = 0.98,
XUNIF_EMIS(2,11)     = 0.98,    XUNIF_EMIS(6,11)     = 0.98,    XUNIF_EMIS(10,11)     = 0.98,
XUNIF_EMIS(2,12)     = 0.98,    XUNIF_EMIS(6,12)     = 0.98,    XUNIF_EMIS(10,12)     = 0.98,
XUNIF_VEG (3,1)      = 0.,      XUNIF_VEG (7,1)      = 0.,      XUNIF_VEG (11,1)      = 0.,
XUNIF_VEG (3,2)      = 0.,      XUNIF_VEG (7,2)      = 0.,      XUNIF_VEG (11,2)      = 0.,
XUNIF_VEG (3,3)      = 0.,      XUNIF_VEG (7,3)      = 0.,      XUNIF_VEG (11,3)      = 0.,
XUNIF_VEG (3,4)      = 0.,      XUNIF_VEG (7,4)      = 0.,      XUNIF_VEG (11,4)      = 0.,
XUNIF_VEG (3,5)      = 0.5,     XUNIF_VEG (7,5)      = 0.5,     XUNIF_VEG (11,5)      = 0.5,
XUNIF_VEG (3,6)      = 0.9,     XUNIF_VEG (7,6)      = 0.9,     XUNIF_VEG (11,6)      = 0.9,
XUNIF_VEG (3,7)      = 0.9,     XUNIF_VEG (7,7)      = 0.9,     XUNIF_VEG (11,7)      = 0.9,
XUNIF_VEG (3,8)      = 0.9,     XUNIF_VEG (7,8)      = 0.9,     XUNIF_VEG (11,8)      = 0.9,
XUNIF_VEG (3,9)      = 0.9,     XUNIF_VEG (7,9)      = 0.9,     XUNIF_VEG (11,9)      = 0.9,
XUNIF_VEG (3,10)     = 0.,      XUNIF_VEG (7,10)     = 0.,      XUNIF_VEG (11,10)     = 0.,
XUNIF_VEG (3,11)     = 0.,      XUNIF_VEG (7,11)     = 0.,      XUNIF_VEG (11,11)     = 0.,
XUNIF_VEG (3,12)     = 0.,      XUNIF_VEG (7,12)     = 0.,      XUNIF_VEG (11,12)     = 0.,
XUNIF_LAI (3,1)      = 0.,      XUNIF_LAI (7,1)      = 0.,      XUNIF_LAI (11,1)      = 0.,
XUNIF_LAI (3,2)      = 0.,      XUNIF_LAI (7,2)      = 0.,      XUNIF_LAI (11,2)      = 0.,
XUNIF_LAI (3,3)      = 0.,      XUNIF_LAI (7,3)      = 0.,      XUNIF_LAI (11,3)      = 0.,
XUNIF_LAI (3,4)      = 0.,      XUNIF_LAI (7,4)      = 0.,      XUNIF_LAI (11,4)      = 0.,
XUNIF_LAI (3,5)      = 1.,      XUNIF_LAI (7,5)      = 1.,      XUNIF_LAI (11,5)      = 1.,
XUNIF_LAI (3,6)      = 3.,      XUNIF_LAI (7,6)      = 3.,      XUNIF_LAI (11,6)      = 3.,
XUNIF_LAI (3,7)      = 3.,      XUNIF_LAI (7,7)      = 3.,      XUNIF_LAI (11,7)      = 3.,
XUNIF_LAI (3,8)      = 3.,      XUNIF_LAI (7,8)      = 3.,      XUNIF_LAI (11,8)      = 3.,
XUNIF_LAI (3,9)      = 3.,      XUNIF_LAI (7,9)      = 3.,      XUNIF_LAI (11,9)      = 3.,
XUNIF_LAI (3,10)     = 0.,      XUNIF_LAI (7,10)     = 0.,      XUNIF_LAI (11,10)     = 0.,
XUNIF_LAI (3,11)     = 0.,      XUNIF_LAI (7,11)     = 0.,      XUNIF_LAI (11,11)     = 0.,
XUNIF_LAI (3,12)     = 0.,      XUNIF_LAI (7,12)     = 0.,      XUNIF_LAI (11,12)     = 0.,
XUNIF_ZO  (3,1)      = 0.01,    XUNIF_ZO  (7,1)      = 0.01,    XUNIF_ZO  (11,1)      = 0.01,
XUNIF_ZO  (3,2)      = 0.01,    XUNIF_ZO  (7,2)      = 0.01,    XUNIF_ZO  (11,2)      = 0.01,
XUNIF_ZO  (3,3)      = 0.01,    XUNIF_ZO  (7,3)      = 0.01,    XUNIF_ZO  (11,3)      = 0.01,
XUNIF_ZO  (3,4)      = 0.01,    XUNIF_ZO  (7,4)      = 0.01,    XUNIF_ZO  (11,4)      = 0.01,
XUNIF_ZO  (3,5)      = 0.05,    XUNIF_ZO  (7,5)      = 0.05,    XUNIF_ZO  (11,5)      = 0.05,
XUNIF_ZO  (3,6)      = 0.15,    XUNIF_ZO  (7,6)      = 0.15,    XUNIF_ZO  (11,6)      = 0.15,
XUNIF_ZO  (3,7)      = 0.15,    XUNIF_ZO  (7,7)      = 0.15,    XUNIF_ZO  (11,7)      = 0.15,
XUNIF_ZO  (3,8)      = 0.15,    XUNIF_ZO  (7,8)      = 0.15,    XUNIF_ZO  (11,8)      = 0.15,
XUNIF_ZO  (3,9)      = 0.15,    XUNIF_ZO  (7,9)      = 0.15,    XUNIF_ZO  (11,9)      = 0.15,
XUNIF_ZO  (3,10)     = 0.01,    XUNIF_ZO  (7,10)     = 0.01,    XUNIF_ZO  (11,10)     = 0.01,
XUNIF_ZO  (3,11)     = 0.01,    XUNIF_ZO  (7,11)     = 0.01,    XUNIF_ZO  (11,11)     = 0.01,
XUNIF_ZO  (3,12)     = 0.01,    XUNIF_ZO  (7,12)     = 0.01,    XUNIF_ZO  (11,12)     = 0.01,
XUNIF_EMIS(3,1)      = 0.98,    XUNIF_EMIS(7,1)      = 0.98,    XUNIF_EMIS(11,1)      = 0.98,
XUNIF_EMIS(3,2)      = 0.98,    XUNIF_EMIS(7,2)      = 0.98,    XUNIF_EMIS(11,2)      = 0.98,
XUNIF_EMIS(3,3)      = 0.98,    XUNIF_EMIS(7,3)      = 0.98,    XUNIF_EMIS(11,3)      = 0.98,
XUNIF_EMIS(3,4)      = 0.98,    XUNIF_EMIS(7,4)      = 0.98,    XUNIF_EMIS(11,4)      = 0.98,
XUNIF_EMIS(3,5)      = 0.98,    XUNIF_EMIS(7,5)      = 0.98,    XUNIF_EMIS(11,5)      = 0.98,
XUNIF_EMIS(3,6)      = 0.98,    XUNIF_EMIS(7,6)      = 0.98,    XUNIF_EMIS(11,6)      = 0.98,
XUNIF_EMIS(3,7)      = 0.98,    XUNIF_EMIS(7,7)      = 0.98,    XUNIF_EMIS(11,7)      = 0.98,
XUNIF_EMIS(3,8)      = 0.98,    XUNIF_EMIS(7,8)      = 0.98,    XUNIF_EMIS(11,8)      = 0.98,
XUNIF_EMIS(3,9)      = 0.98,    XUNIF_EMIS(7,9)      = 0.98,    XUNIF_EMIS(11,9)      = 0.98,
XUNIF_EMIS(3,10)     = 0.98,    XUNIF_EMIS(7,10)     = 0.98,    XUNIF_EMIS(11,10)     = 0.98,
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XUNIF_EMIS(3,11)     = 0.98,     XUNIF_EMIS(7,11)     = 0.98,     XUNIF_EMIS(11,11)     = 0.98,
XUNIF_EMIS(3,12)     = 0.98,     XUNIF_EMIS(7,12)     = 0.98,     XUNIF_EMIS(11,12)     = 0.98,
XUNIF_VEG (4,1)      = 0.,       XUNIF_VEG (8,1)      = 0.,       XUNIF_VEG (12,1)      = 0.,
XUNIF_VEG (4,2)      = 0.,       XUNIF_VEG (8,2)      = 0.,       XUNIF_VEG (12,2)      = 0.,
XUNIF_VEG (4,3)      = 0.,       XUNIF_VEG (8,3)      = 0.,       XUNIF_VEG (12,3)      = 0.,
XUNIF_VEG (4,4)      = 0.,       XUNIF_VEG (8,4)      = 0.,       XUNIF_VEG (12,4)      = 0.,
XUNIF_VEG (4,5)      = 0.5,      XUNIF_VEG (8,5)      = 0.5,      XUNIF_VEG (12,5)      = 0.5,
XUNIF_VEG (4,6)      = 0.9,      XUNIF_VEG (8,6)      = 0.9,      XUNIF_VEG (12,6)      = 0.9,
XUNIF_VEG (4,7)      = 0.9,      XUNIF_VEG (8,7)      = 0.9,      XUNIF_VEG (12,7)      = 0.9,
XUNIF_VEG (4,8)      = 0.9,      XUNIF_VEG (8,8)      = 0.9,      XUNIF_VEG (12,8)      = 0.9,
XUNIF_VEG (4,9)      = 0.9,      XUNIF_VEG (8,9)      = 0.9,      XUNIF_VEG (12,9)      = 0.9,
XUNIF_VEG (4,10)     = 0.,       XUNIF_VEG (8,10)     = 0.,       XUNIF_VEG (12,10)     = 0.,
XUNIF_VEG (4,11)     = 0.,       XUNIF_VEG (8,11)     = 0.,       XUNIF_VEG (12,11)     = 0.,
XUNIF_VEG (4,12)     = 0.,       XUNIF_VEG (8,12)     = 0.,       XUNIF_VEG (12,12)     = 0.,
XUNIF_LAI (4,1)      = 0.,       XUNIF_LAI (8,1)      = 0.,       XUNIF_LAI (12,1)      = 0.,
XUNIF_LAI (4,2)      = 0.,       XUNIF_LAI (8,2)      = 0.,       XUNIF_LAI (12,2)      = 0.,
XUNIF_LAI (4,3)      = 0.,       XUNIF_LAI (8,3)      = 0.,       XUNIF_LAI (12,3)      = 0.,
XUNIF_LAI (4,4)      = 0.,       XUNIF_LAI (8,4)      = 0.,       XUNIF_LAI (12,4)      = 0.,
XUNIF_LAI (4,5)      = 1.,       XUNIF_LAI (8,5)      = 1.,       XUNIF_LAI (12,5)      = 1.,
XUNIF_LAI (4,6)      = 3.,       XUNIF_LAI (8,6)      = 3.,       XUNIF_LAI (12,6)      = 3.,
XUNIF_LAI (4,7)      = 3.,       XUNIF_LAI (8,7)      = 3.,       XUNIF_LAI (12,7)      = 3.,
XUNIF_LAI (4,8)      = 3.,       XUNIF_LAI (8,8)      = 3.,       XUNIF_LAI (12,8)      = 3.,
XUNIF_LAI (4,9)      = 3.,       XUNIF_LAI (8,9)      = 3.,       XUNIF_LAI (12,9)      = 3.,
XUNIF_LAI (4,10)     = 0.,       XUNIF_LAI (8,10)     = 0.,       XUNIF_LAI (12,10)     = 0.,
XUNIF_LAI (4,11)     = 0.,       XUNIF_LAI (8,11)     = 0.,       XUNIF_LAI (12,11)     = 0.,
XUNIF_LAI (4,12)     = 0.,       XUNIF_LAI (8,12)     = 0.,       XUNIF_LAI (12,12)     = 0.,
XUNIF_Z0  (4,1)      = 0.01,     XUNIF_Z0  (8,1)      = 0.01,     XUNIF_Z0  (12,1)      = 0.01,
XUNIF_Z0  (4,2)      = 0.01,     XUNIF_Z0  (8,2)      = 0.01,     XUNIF_Z0  (12,2)      = 0.01,
XUNIF_Z0  (4,3)      = 0.01,     XUNIF_Z0  (8,3)      = 0.01,     XUNIF_Z0  (12,3)      = 0.01,
XUNIF_Z0  (4,4)      = 0.01,     XUNIF_Z0  (8,4)      = 0.01,     XUNIF_Z0  (12,4)      = 0.01,
XUNIF_Z0  (4,5)      = 0.05,     XUNIF_Z0  (8,5)      = 0.05,     XUNIF_Z0  (12,5)      = 0.05,
XUNIF_Z0  (4,6)      = 0.15,     XUNIF_Z0  (8,6)      = 0.15,     XUNIF_Z0  (12,6)      = 0.15,
XUNIF_Z0  (4,7)      = 0.15,     XUNIF_Z0  (8,7)      = 0.15,     XUNIF_Z0  (12,7)      = 0.15,
XUNIF_Z0  (4,8)      = 0.15,     XUNIF_Z0  (8,8)      = 0.15,     XUNIF_Z0  (12,8)      = 0.15,
XUNIF_Z0  (4,9)      = 0.15,     XUNIF_Z0  (8,9)      = 0.15,     XUNIF_Z0  (12,9)      = 0.15,
XUNIF_Z0  (4,10)     = 0.01,     XUNIF_Z0  (8,10)     = 0.01,     XUNIF_Z0  (12,10)     = 0.01,
XUNIF_Z0  (4,11)     = 0.01,     XUNIF_Z0  (8,11)     = 0.01,     XUNIF_Z0  (12,11)     = 0.01,
XUNIF_Z0  (4,12)     = 0.01,     XUNIF_Z0  (8,12)     = 0.01,     XUNIF_Z0  (12,12)     = 0.01,
XUNIF_EMIS(4,1)      = 0.98,     XUNIF_EMIS(8,1)      = 0.98,     XUNIF_EMIS(12,1)      = 0.98,
XUNIF_EMIS(4,2)      = 0.98,     XUNIF_EMIS(8,2)      = 0.98,     XUNIF_EMIS(12,2)      = 0.98,
XUNIF_EMIS(4,3)      = 0.98,     XUNIF_EMIS(8,3)      = 0.98,     XUNIF_EMIS(12,3)      = 0.98,
XUNIF_EMIS(4,4)      = 0.98,     XUNIF_EMIS(8,4)      = 0.98,     XUNIF_EMIS(12,4)      = 0.98,
XUNIF_EMIS(4,5)      = 0.98,     XUNIF_EMIS(8,5)      = 0.98,     XUNIF_EMIS(12,5)      = 0.98,
XUNIF_EMIS(4,6)      = 0.98,     XUNIF_EMIS(8,6)      = 0.98,     XUNIF_EMIS(12,6)      = 0.98,
XUNIF_EMIS(4,7)      = 0.98,     XUNIF_EMIS(8,7)      = 0.98,     XUNIF_EMIS(12,7)      = 0.98,
XUNIF_EMIS(4,8)      = 0.98,     XUNIF_EMIS(8,8)      = 0.98,     XUNIF_EMIS(12,8)      = 0.98,
XUNIF_EMIS(4,9)      = 0.98,     XUNIF_EMIS(8,9)      = 0.98,     XUNIF_EMIS(12,9)      = 0.98,
XUNIF_EMIS(4,10)     = 0.98,     XUNIF_EMIS(8,10)     = 0.98,     XUNIF_EMIS(12,10)     = 0.98,
XUNIF_EMIS(4,11)     = 0.98,     XUNIF_EMIS(8,11)     = 0.98,     XUNIF_EMIS(12,11)     = 0.98,
XUNIF_EMIS(4,12)     = 0.98,     XUNIF_EMIS(8,12)     = 0.98,     XUNIF_EMIS(12,12)     = 0.98,
XUNIF_DG(1,1)        = 0.01,     XUNIF_DG(5,1)        = 0.01,     XUNIF_DG(9,1)         = 0.01,
XUNIF_DG(1,2)        = 1.60,     XUNIF_DG(5,2)        = 1.60,     XUNIF_DG(9,2)         = 1.60,
XUNIF_DG(1,3)        = 1.60,     XUNIF_DG(5,3)        = 1.60,     XUNIF_DG(9,3)         = 1.60,
XUNIF_DG(2,1)        = 0.01,     XUNIF_DG(6,1)        = 0.01,     XUNIF_DG(10,1)        = 0.01,
XUNIF_DG(2,2)        = 1.60,     XUNIF_DG(6,2)        = 1.60,     XUNIF_DG(10,2)        = 1.60,
XUNIF_DG(2,3)        = 1.60,     XUNIF_DG(6,3)        = 1.60,     XUNIF_DG(10,3)        = 1.60,
XUNIF_DG(3,1)        = 0.01,     XUNIF_DG(7,1)        = 0.01,     XUNIF_DG(11,1)        = 0.01,
XUNIF_DG(3,2)        = 1.60,     XUNIF_DG(7,2)        = 1.60,     XUNIF_DG(11,2)        = 1.60,
XUNIF_DG(3,3)        = 1.60,     XUNIF_DG(7,3)        = 1.60,     XUNIF_DG(11,3)        = 1.60,
XUNIF_DG(4,1)        = 0.01,     XUNIF_DG(8,1)        = 0.01,     XUNIF_DG(12,1)        = 0.01,
XUNIF_DG(4,2)        = 1.60,     XUNIF_DG(8,2)        = 1.60,     XUNIF_DG(12,2)        = 1.60,
XUNIF_DG(4,3)        = 1.60,     XUNIF_DG(8,3)        = 1.60,     XUNIF_DG(12,3)        = 1.60,
XUNIF_ROOTFRAC(1,1)  = -999.,    XUNIF_ROOTFRAC(5,1)  = -999.,    XUNIF_ROOTFRAC(9,1)   = -999.,
XUNIF_ROOTFRAC(1,2)  = -999.,    XUNIF_ROOTFRAC(5,2)  = -999.,    XUNIF_ROOTFRAC(9,2)   = -999.,
XUNIF_ROOTFRAC(1,3)  = -999.,    XUNIF_ROOTFRAC(5,3)  = -999.,    XUNIF_ROOTFRAC(9,3)   = -999.,
XUNIF_ROOTFRAC(2,1)  = -999.,    XUNIF_ROOTFRAC(6,1)  = -999.,    XUNIF_ROOTFRAC(10,1)  = -999.,
XUNIF_ROOTFRAC(2,2)  = -999.,    XUNIF_ROOTFRAC(6,2)  = -999.,    XUNIF_ROOTFRAC(10,2)  = -999.,
XUNIF_ROOTFRAC(2,3)  = -999.,    XUNIF_ROOTFRAC(6,3)  = -999.,    XUNIF_ROOTFRAC(10,3)  = -999.,
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XUNIF_ROOTFRAC(3,1)  = -999.,    XUNIF_ROOTFRAC(7,1)  = -999.,   XUNIF_ROOTFRAC(11,1)  = -999.,
XUNIF_ROOTFRAC(3,2)  = -999.,    XUNIF_ROOTFRAC(7,2)  = -999.,   XUNIF_ROOTFRAC(11,2)  = -999.,
XUNIF_ROOTFRAC(3,3)  = -999.,    XUNIF_ROOTFRAC(7,3)  = -999.,   XUNIF_ROOTFRAC(11,3)  = -999.,
XUNIF_ROOTFRAC(4,1)  = -999.,    XUNIF_ROOTFRAC(8,1)  = -999.,   XUNIF_ROOTFRAC(12,1)  = -999.,
XUNIF_ROOTFRAC(4,2)  = -999.,    XUNIF_ROOTFRAC(8,2)  = -999.,   XUNIF_ROOTFRAC(12,2)  = -999.,
XUNIF_ROOTFRAC(4,3)  = -999.,    XUNIF_ROOTFRAC(8,3)  = -999.,   XUNIF_ROOTFRAC(12,3)  = -999.,
XUNIF_RSMIN       (1)= 40.,      XUNIF_RSMIN       (2)= 40.,        XUNIF_RSMIN       (3)= 40.,
XUNIF_GAMMA       (1)= 0.,       XUNIF_GAMMA       (2)= 0.,         XUNIF_GAMMA       (3)= 0.,
XUNIF_WRMAX_CF    (1)= 0.2,      XUNIF_WRMAX_CF    (2)= 0.2,        XUNIF_WRMAX_CF    (3)= 0.2,
XUNIF_RGL         (1)= 100.,     XUNIF_RGL         (2)= 100.,       XUNIF_RGL         (3)= 100.,
XUNIF_CV          (1)= 0.00002,  XUNIF_CV          (2)= 0.00002,    XUNIF_CV          (3)= 0.00002,
XUNIF_Z0_O_Z0H    (1)= 10.,      XUNIF_Z0_O_Z0H    (2)= 10.,        XUNIF_Z0_O_Z0H    (3)= 10.,
XUNIF_ALBNIR_VEG  (1)= 0.3,      XUNIF_ALBNIR_VEG  (2)= 0.3,        XUNIF_ALBNIR_VEG  (3)= 0.3,
XUNIF_ALBVIS_VEG  (1)= 0.1,      XUNIF_ALBVIS_VEG  (2)= 0.1,        XUNIF_ALBVIS_VEG  (3)= 0.1,
XUNIF_ALBUV_VEG   (1)= 0.0425,   XUNIF_ALBUV_VEG   (2)= 0.0425,     XUNIF_ALBUV_VEG   (3)= 0.0425,
XUNIF_ALBNIR_SOIL (1)= 0.3,      XUNIF_ALBNIR_SOIL (2)= 0.3,        XUNIF_ALBNIR_SOIL (3)= 0.3,
XUNIF_ALBVIS_SOIL (1)= 0.1,      XUNIF_ALBVIS_SOIL (2)= 0.1,        XUNIF_ALBVIS_SOIL (3)= 0.1,
XUNIF_ALBUV_SOIL  (1)= 0.06,     XUNIF_ALBUV_SOIL  (2)= 0.06,       XUNIF_ALBUV_SOIL  (3)= 0.06,
XUNIF_GMES        (1)= 0.003,    XUNIF_GMES        (2)= 0.003,      XUNIF_GMES        (3)= 0.003,
XUNIF_RE25        (1)= 0.0000003,XUNIF_RE25        (2)= 0.0000003,  XUNIF_RE25        (3)= 0.0000003,
XUNIF_BSLAI       (1)= 0.06,     XUNIF_BSLAI       (2)= 0.06,       XUNIF_BSLAI       (3)= 0.06,
XUNIF_LAIMIN      (1)= 0.3,      XUNIF_LAIMIN      (2)= 0.3,        XUNIF_LAIMIN      (3)= 0.3,
XUNIF_SEFOLD      (1)= 5184000., XUNIF_SEFOLD      (2)= 5184000.,   XUNIF_SEFOLD      (3)= 5184000.,
XUNIF_GC          (1)= 0.00025,  XUNIF_GC          (2)= 0.00025,    XUNIF_GC          (3)= 0.00025,
XUNIF_DMAX        (1)= 0.1,      XUNIF_DMAX        (2)= 0.1,        XUNIF_DMAX        (3)= 0.1,
XUNIF_F2I         (1)= 0.3,      XUNIF_F2I         (2)= 0.3,        XUNIF_F2I         (3)= 0.3,
XUNIF_H_TREE      (1)= 20.,      XUNIF_H_TREE      (2)= 20.,        XUNIF_H_TREE      (3)= 20.,
XUNIF_CE_NITRO    (1)= 3.79,     XUNIF_CE_NITRO    (2)= 3.79,       XUNIF_CE_NITRO    (3)= 3.79,
XUNIF_CF_NITRO    (1)= 9.84,     XUNIF_CF_NITRO    (2)= 9.84,       XUNIF_CF_NITRO    (3)= 9.84,
XUNIF_CNA_NITRO   (1)= 1.3,      XUNIF_CNA_NITRO   (2)= 1.3,        XUNIF_CNA_NITRO   (3)= 1.3,
XUNIF_RSMIN       (4)= 40.,      XUNIF_RSMIN       (5)= 40.,        XUNIF_RSMIN       (6)= 40.,
XUNIF_GAMMA       (4)= 0.,       XUNIF_GAMMA       (5)= 0.,         XUNIF_GAMMA       (6)= 0.,
XUNIF_WRMAX_CF    (4)= 0.2,      XUNIF_WRMAX_CF    (5)= 0.2,        XUNIF_WRMAX_CF    (6)= 0.2,
XUNIF_RGL         (4)= 100.,     XUNIF_RGL         (5)= 100.,       XUNIF_RGL         (6)= 100.,
XUNIF_CV          (4)= 0.00002,  XUNIF_CV          (5)= 0.00002,    XUNIF_CV          (6)= 0.00002,
XUNIF_Z0_O_Z0H    (4)= 10.,      XUNIF_Z0_O_Z0H    (5)= 10.,        XUNIF_Z0_O_Z0H    (6)= 10.,
XUNIF_ALBNIR_VEG  (4)= 0.3,      XUNIF_ALBNIR_VEG  (5)= 0.3,        XUNIF_ALBNIR_VEG  (6)= 0.3,
XUNIF_ALBVIS_VEG  (4)= 0.1,      XUNIF_ALBVIS_VEG  (5)= 0.1,        XUNIF_ALBVIS_VEG  (6)= 0.1,
XUNIF_ALBUV_VEG   (4)= 0.0425,   XUNIF_ALBUV_VEG   (5)= 0.0425,     XUNIF_ALBUV_VEG   (6)= 0.0425,
XUNIF_ALBNIR_SOIL (4)= 0.3,      XUNIF_ALBNIR_SOIL (5)= 0.3,        XUNIF_ALBNIR_SOIL (6)= 0.3,
XUNIF_ALBVIS_SOIL (4)= 0.1,      XUNIF_ALBVIS_SOIL (5)= 0.1,        XUNIF_ALBVIS_SOIL (6)= 0.1,
XUNIF_ALBUV_SOIL  (4)= 0.06,     XUNIF_ALBUV_SOIL  (5)= 0.06,       XUNIF_ALBUV_SOIL  (6)= 0.06,
XUNIF_GMES        (4)= 0.003,    XUNIF_GMES        (5)= 0.003,      XUNIF_GMES        (6)= 0.003,
XUNIF_RE25        (4)= 0.0000003,XUNIF_RE25        (5)= 0.0000003,  XUNIF_RE25        (6)= 0.0000003,
XUNIF_BSLAI       (4)= 0.06,     XUNIF_BSLAI       (5)= 0.06,       XUNIF_BSLAI       (6)= 0.06,
XUNIF_LAIMIN      (4)= 0.3,      XUNIF_LAIMIN      (5)= 0.3,        XUNIF_LAIMIN      (6)= 0.3,
XUNIF_SEFOLD      (4)= 5184000., XUNIF_SEFOLD      (5)= 5184000.,   XUNIF_SEFOLD      (6)= 5184000.,
XUNIF_GC          (4)= 0.00025,  XUNIF_GC          (5)= 0.00025,    XUNIF_GC          (6)= 0.00025,
XUNIF_DMAX        (4)= 0.1,      XUNIF_DMAX        (5)= 0.1,        XUNIF_DMAX        (6)= 0.1,
XUNIF_F2I         (4)= 0.3,      XUNIF_F2I         (5)= 0.3,        XUNIF_F2I         (6)= 0.3,
XUNIF_H_TREE      (4)= 20.,      XUNIF_H_TREE      (5)= 20.,        XUNIF_H_TREE      (6)= 20.,
XUNIF_CE_NITRO    (4)= 3.79,     XUNIF_CE_NITRO    (5)= 3.79,       XUNIF_CE_NITRO    (6)= 3.79,
XUNIF_CF_NITRO    (4)= 9.84,     XUNIF_CF_NITRO    (5)= 9.84,       XUNIF_CF_NITRO    (6)= 9.84,
XUNIF_CNA_NITRO   (4)= 1.3,      XUNIF_CNA_NITRO   (5)= 1.3,        XUNIF_CNA_NITRO   (6)= 1.3,
XUNIF_RSMIN       (7)= 40.,      XUNIF_RSMIN       (8)= 40.,        XUNIF_RSMIN       (9)= 40.,
XUNIF_GAMMA       (7)= 0.,       XUNIF_GAMMA       (8)= 0.,         XUNIF_GAMMA       (9)= 0.,
XUNIF_WRMAX_CF    (7)= 0.2,      XUNIF_WRMAX_CF    (8)= 0.2,        XUNIF_WRMAX_CF    (9)= 0.2,
XUNIF_RGL         (7)= 100.,     XUNIF_RGL         (8)= 100.,       XUNIF_RGL         (9)= 100.,
XUNIF_CV          (7)= 0.00002,  XUNIF_CV          (8)= 0.00002,    XUNIF_CV          (9)= 0.00002,
XUNIF_Z0_O_Z0H    (7)= 10.,      XUNIF_Z0_O_Z0H    (8)= 10.,        XUNIF_Z0_O_Z0H    (9)= 10.,
XUNIF_ALBNIR_VEG  (7)= 0.3,      XUNIF_ALBNIR_VEG  (8)= 0.3,        XUNIF_ALBNIR_VEG  (9)= 0.3,
XUNIF_ALBVIS_VEG  (7)= 0.1,      XUNIF_ALBVIS_VEG  (8)= 0.1,        XUNIF_ALBVIS_VEG  (9)= 0.1,
XUNIF_ALBUV_VEG   (7)= 0.0425,   XUNIF_ALBUV_VEG   (8)= 0.0425,     XUNIF_ALBUV_VEG   (9)= 0.0425,
XUNIF_ALBNIR_SOIL (7)= 0.3,      XUNIF_ALBNIR_SOIL (8)= 0.3,        XUNIF_ALBNIR_SOIL (9)= 0.3,
XUNIF_ALBVIS_SOIL (7)= 0.1,      XUNIF_ALBVIS_SOIL (8)= 0.1,        XUNIF_ALBVIS_SOIL (9)= 0.1,
XUNIF_ALBUV_SOIL  (7)= 0.06,     XUNIF_ALBUV_SOIL  (8)= 0.06,       XUNIF_ALBUV_SOIL  (9)= 0.06,
XUNIF_GMES        (7)= 0.003,    XUNIF_GMES        (8)= 0.003,      XUNIF_GMES        (9)= 0.003,
XUNIF_RE25        (7)= 0.0000003,XUNIF_RE25        (8)= 0.0000003,  XUNIF_RE25        (9)= 0.0000003,
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                      XUNIF_BSLAI       (7)= 0.06,     XUNIF_BSLAI       (8)= 0.06,      XUNIF_BSLAI       (9)= 0.06,
                      XUNIF_LAIMIN      (7)= 0.3,      XUNIF_LAIMIN      (8)= 0.3,       XUNIF_LAIMIN      (9)= 0.3,
                      XUNIF_SEFOLD      (7)= 5184000., XUNIF_SEFOLD      (8)= 5184000.,  XUNIF_SEFOLD      (9)= 5184000.,
                      XUNIF_GC          (7)= 0.00025,  XUNIF_GC          (8)= 0.00025,   XUNIF_GC          (9)= 0.00025,
                      XUNIF_DMAX        (7)= 0.1,      XUNIF_DMAX        (8)= 0.1,       XUNIF_DMAX        (9)= 0.1,
                      XUNIF_F2I         (7)= 0.3,      XUNIF_F2I         (8)= 0.3,       XUNIF_F2I         (9)= 0.3,
                      XUNIF_H_TREE      (7)= 20.,      XUNIF_H_TREE      (8)= 20.,       XUNIF_H_TREE      (9)= 20.,
                      XUNIF_CE_NITRO    (7)= 3.79,     XUNIF_CE_NITRO    (8)= 3.79,      XUNIF_CE_NITRO    (9)= 3.79,
                      XUNIF_CF_NITRO    (7)= 9.84,     XUNIF_CF_NITRO    (8)= 9.84,      XUNIF_CF_NITRO    (9)= 9.84,
                      XUNIF_CNA_NITRO   (7)= 1.3,      XUNIF_CNA_NITRO   (8)= 1.3,       XUNIF_CNA_NITRO   (9)= 1.3,
                      XUNIF_RSMIN       (10)= 40.,      XUNIF_RSMIN       (11)= 40.,       XUNIF_RSMIN       (12)= 40.,
                      XUNIF_GAMMA       (10)= 0.,       XUNIF_GAMMA       (11)= 0.,        XUNIF_GAMMA       (12)= 0.,
                      XUNIF_WRMAX_CF    (10)= 0.2,      XUNIF_WRMAX_CF    (11)= 0.2,       XUNIF_WRMAX_CF    (12)= 0.2,
                      XUNIF_RGL         (10)= 100.,     XUNIF_RGL         (11)= 100.,      XUNIF_RGL         (12)= 100.,
                      XUNIF_CV          (10)= 0.00002,  XUNIF_CV          (11)= 0.00002,   XUNIF_CV          (12)= 0.00002,
                      XUNIF_Z0_O_Z0H    (10)= 10.,      XUNIF_Z0_O_Z0H    (11)= 10.,       XUNIF_Z0_O_Z0H    (12)= 10.,
                      XUNIF_ALBNIR_VEG  (10)= 0.3,      XUNIF_ALBNIR_VEG  (11)= 0.3,       XUNIF_ALBNIR_VEG  (12)= 0.3,
                      XUNIF_ALBVIS_VEG  (10)= 0.1,      XUNIF_ALBVIS_VEG  (11)= 0.1,       XUNIF_ALBVIS_VEG  (12)= 0.1,
                      XUNIF_ALBUV_VEG   (10)= 0.0425,   XUNIF_ALBUV_VEG   (11)= 0.0425,    XUNIF_ALBUV_VEG   (12)= 0.0425,
                      XUNIF_ALBNIR_SOIL (10)= 0.3,      XUNIF_ALBNIR_SOIL (11)= 0.3,       XUNIF_ALBNIR_SOIL (12)= 0.3,
                      XUNIF_ALBVIS_SOIL (10)= 0.1,      XUNIF_ALBVIS_SOIL (11)= 0.1,       XUNIF_ALBVIS_SOIL (12)= 0.1,
                      XUNIF_ALBUV_SOIL  (10)= 0.06,     XUNIF_ALBUV_SOIL  (11)= 0.06,      XUNIF_ALBUV_SOIL  (12)= 0.06,
                      XUNIF_GMES        (10)= 0.003,    XUNIF_GMES        (11)= 0.003,     XUNIF_GMES        (12)= 0.003,
                      XUNIF_RE25        (10)= 0.0000003,XUNIF_RE25        (11)= 0.0000003, XUNIF_RE25        (12)= 0.0000003,
                      XUNIF_BSLAI       (10)= 0.06,     XUNIF_BSLAI       (11)= 0.06,      XUNIF_BSLAI       (12)= 0.06,
                      XUNIF_LAIMIN      (10)= 0.3,      XUNIF_LAIMIN      (11)= 0.3,       XUNIF_LAIMIN      (12)= 0.3,
                      XUNIF_SEFOLD      (10)= 5184000., XUNIF_SEFOLD      (11)= 5184000.,  XUNIF_SEFOLD      (12)= 5184000.,
                      XUNIF_GC          (10)= 0.00025,  XUNIF_GC          (11)= 0.00025,   XUNIF_GC          (12)= 0.00025,
                      XUNIF_DMAX        (10)= 0.1,      XUNIF_DMAX        (11)= 0.1,       XUNIF_DMAX        (12)= 0.1,
                      XUNIF_F2I         (10)= 0.3,      XUNIF_F2I         (11)= 0.3,       XUNIF_F2I         (12)= 0.3,
                      XUNIF_H_TREE      (10)= 20.,      XUNIF_H_TREE      (11)= 20.,       XUNIF_H_TREE      (12)= 20.,
                      XUNIF_CE_NITRO    (10)= 3.79,     XUNIF_CE_NITRO    (11)= 3.79,      XUNIF_CE_NITRO    (12)= 3.79,
                      XUNIF_CF_NITRO    (10)= 9.84,     XUNIF_CF_NITRO    (11)= 9.84,      XUNIF_CF_NITRO    (12)= 9.84,
                      XUNIF_CNA_NITRO   (10)= 1.3,      XUNIF_CNA_NITRO   (11)= 1.3,       XUNIF_CNA_NITRO   (12)= 1.3,
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&NAM_DATA_TEB         NROOF_LAYER      = 3,
                      XUNIF_ALB_ROOF   = 0.2,
                      XUNIF_EMIS_ROOF  = 0.97,
                      XUNIF_HC_ROOF(1) = 2110000.,
                      XUNIF_HC_ROOF(2) = 2800000.,
                      XUNIF_HC_ROOF(3) = 2900000.,
                      XUNIF_TC_ROOF(1) = 1.51,
                      XUNIF_TC_ROOF(2) = 0.08,
                      XUNIF_TC_ROOF(3) = 0.05,
                      XUNIF_D_ROOF(1)  = 0.05,
                      XUNIF_D_ROOF(2)  = 0.4,
                      XUNIF_D_ROOF(3)  = 0.1,
                      NROAD_LAYER      = 3,
                      XUNIF_ALB_ROAD   = 0.2,
                      XUNIF_EMIS_ROAD  = 0.97,
                      XUNIF_HC_ROAD(1) = 2110000.,
                      XUNIF_HC_ROAD(2) = 2800000.,
                      XUNIF_HC_ROAD(3) = 2900000.,
                      XUNIF_TC_ROAD(1) = 1.51,
                      XUNIF_TC_ROAD(2) = 0.08,
                      XUNIF_TC_ROAD(3) = 0.05,
                      XUNIF_D_ROAD(1)  = 0.05,
                      XUNIF_D_ROAD(2)  = 0.4,
                      XUNIF_D_ROAD(3)  = 0.1,
                      NWALL_LAYER      = 3,
                      XUNIF_ALB_WALL   = 0.2,
                      XUNIF_EMIS_WALL  = 0.97,
                      XUNIF_HC_WALL(1) = 2110000.,
                      XUNIF_HC_WALL(2) = 2800000.,
                      XUNIF_HC_WALL(3) = 2900000.,
                      XUNIF_TC_WALL(1) = 1.51,
                      XUNIF_TC_WALL(2) = 0.08,
                      XUNIF_TC_WALL(3) = 0.05,
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                     XUNIF_D_WALL(1)  = 0.05,
                     XUNIF_D_WALL(2)  = 0.4,
                     XUNIF_D_WALL(3)  = 0.1,
                     XUNIF_Z0_TOWN    = 1.,
                     XUNIF_BLD        = 0.5,
                     XUNIF_BLD_HEIGHT = 10.,
                     XUNIF_WALL_O_HOR = 0.5,
                     XUNIF_H_TRAFFIC  = 10.,
                     XUNIF_LE_TRAFFIC = 0.,
                     XUNIF_H_INDUSTRY = 5.,
                     XUNIF_LE_INDUSTRY= 0.
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&NAM_FRAC            LECOCLIMAP = F,
                     XUNIF_SEA    = 0.,
                     XUNIF_WATER  = 0.,
                     XUNIF_TOWN   = 0.,
                     XUNIF_NATURE = 1.
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&NAM_PGD_GRID        CGRID = 'LONLAT REG'
/
&NAM_LONLAT_REG      XLONMIN = 0.           ,
                     XLONMAX = 0.           ,
                     XLATMIN = 0.          ,
                     XLATMAX = 0.          ,
                     NLON    = 1            ,
                     NLAT    = 1
/
&NAM_PGD_SCHEMES     CNATURE = 'ISBA  '    ,
                     CSEA    = 'SEAFLX'    ,
                     CTOWN   = 'TEB   '    ,
                     CWATER  = 'WATFLX'
/
&NAM_ZS              XUNIF_ZS  = 113.
/
&NAM_ISBA            XUNIF_CLAY    = 0.37          ,
                     XUNIF_SAND    = 0.37          ,
             XUNIF_RUNOFFB = 0.5           ,
                     CISBA         = '2-L'         ,
                     CPHOTO        = 'NIT'         ,
                     NPATCH        = 12            ,
                     NGROUND_LAYER = 2
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&NAM_PREPFILE        CPREPFILE = 'PREP'
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&NAM_PREP_SURF_ATM NYEAR  = 1986,
                   NMONTH = 1,
                   NDAY   = 1,
                   XTIME  = 0.
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&NAM_PREP_SEAFLUX  XSST_UNIF = 285.,
                   NYEAR  = 1986,
                   NMONTH = 1,
                   NDAY   = 1,
                   XTIME  = 0.
/
&NAM_PREP_WATFLUX  XTS_WATER_UNIF = 285.,
                   NYEAR  = 1986,
                   NMONTH = 1,
                   NDAY   = 1,
                   XTIME  = 0.
/
&NAM_PREP_TEB      XTI_ROAD= 285.,
                   XTI_BLD = 285.
                   XTS_ROAD= 285.
                   XTS_ROOF= 285.,
                   XTS_WALL= 285.,
                   XWS_ROAD= 0.,
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                   XWS_ROOF= 0.,
                   NYEAR  = 1986,
                   NMONTH = 1,
                   NDAY   = 1,
                   XTIME  = 0.
/
&NAM_PREP_ISBA     XHUG_SURF = 1.,
                   XHUG_ROOT = 1.,
                   XHUG_DEEP = 1.,
                   XTG_SURF  = 276.16,
                   XTG_ROOT  = 276.16,
                   XTG_DEEP  = 276.16,
                   NYEAR  = 1986,
                   NMONTH = 1,
                   NDAY   = 1,
                   XTIME  = 0.
/
&NAM_PREP_ISBA_SNOW    CSNOW = '3-L'
/




&NAM_IO_OFFLINE        LPRINT  = T                       ,
                       CFORCING_FILETYPE =    'NETCDF'    ,
                       CSURF_FILETYPE =       'LFI   '    ,
                       CTIMESERIES_FILETYPE = 'NETCDF'    ,
                       LWRITE_COORD = T,
                       LSET_FORC_ZS=T
/

&NAM_DIAG_SURFn        LSURF_BUDGET = F      ,
                       N2M          = 0      ,
                       LCOEF        = F      ,
                       LSURF_VARS   = F
/
&NAM_DIAG_SURF_ATMn    LFRAC        = F
/
&NAM_DIAG_ISBAn        LPGD              = F ,
                       LSURF_EVAP_BUDGET = F ,
                       LSURF_MISC_BUDGET = F ,
       LSURF_BUDGETC      = F
/
&NAM_DIAG_TEBn         LSURF_MISC_BUDGET = F
/
&NAM_SGH_ISBAn         CRUNOFF    = "WSAT"
/
&NAM_ISBAn             CROUGH     = "Z04D"      ,
                       CSCOND     = "NP89"      ,
                       CALBEDO    = "DRY"       ,
                       CC1DRY     = 'DEF '      ,
                       CSOILFRZ   = 'DEF'       ,
                       CDIFSFCOND = 'DEF '      ,
                       CSNOWRES   = 'DEF'       ,
                       CCPSURF    = 'DRY'
/
&NAM_CH_ISBAn          CCH_DRY_DEP = "WES89 "
/
&NAM_SEAFLUXn          CSEA_ALB = "TA96"
/
&NAM_CH_SEAFLUXn       CCH_DRY_DEP = "WES89 "
/
&NAM_CH_WATFLUXn       CCH_DRY_DEP = "WES89 "
/
&NAM_CH_TEBn           CCH_DRY_DEP = "WES89 "
/
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### A.7.3 Surface parameters read from external files

The following namelist is valid only for simulation without patches. In case of use of patches (like for A-gs options), it should be updated.

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&NAM_DATA_ISBA    NTIME = 12 ,
                  CFNAM_VEGTYPE(1)     = 'VEGTYPE_01.DAT                  ', CFTYP_VEGTYPE(1)     = 'ASCLLV',
                  CFNAM_VEGTYPE(2)     = 'VEGTYPE_02.DAT                  ', CFTYP_VEGTYPE(2)     = 'ASCLLV',
                  CFNAM_VEGTYPE(3)     = 'VEGTYPE_03.DAT                  ', CFTYP_VEGTYPE(3)     = 'ASCLLV',
                  CFNAM_VEGTYPE(4)     = 'VEGTYPE_04.DAT                  ', CFTYP_VEGTYPE(4)     = 'ASCLLV',
                  CFNAM_VEGTYPE(5)     = 'VEGTYPE_05.DAT                  ', CFTYP_VEGTYPE(5)     = 'ASCLLV',
                  CFNAM_VEGTYPE(6)     = 'VEGTYPE_06.DAT                  ', CFTYP_VEGTYPE(6)     = 'ASCLLV',
                  CFNAM_VEGTYPE(7)     = 'VEGTYPE_07.DAT                  ', CFTYP_VEGTYPE(7)     = 'ASCLLV',
                  CFNAM_VEGTYPE(8)     = 'VEGTYPE_08.DAT                  ', CFTYP_VEGTYPE(8)     = 'ASCLLV',
                  CFNAM_VEGTYPE(9)     = 'VEGTYPE_09.DAT                  ', CFTYP_VEGTYPE(9)     = 'ASCLLV',
                  CFNAM_VEGTYPE(10)    = 'VEGTYPE_10.DAT                  ', CFTYP_VEGTYPE(10)    = 'ASCLLV',
                  CFNAM_VEGTYPE(11)    = 'VEGTYPE_11.DAT                  ', CFTYP_VEGTYPE(11)    = 'ASCLLV',
                  CFNAM_VEGTYPE(12)    = 'VEGTYPE_12.DAT                  ', CFTYP_VEGTYPE(12)    = 'ASCLLV',
                  CFNAM_VEG(1,1)       = 'VEG_01.DAT                      ', CFTYP_VEG(1,1)       = 'ASCLLV',
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                  CFNAM_VEG(1,3)       = 'VEG_03.DAT                      ', CFTYP_VEG(1,3)       = 'ASCLLV',
                  CFNAM_VEG(1,4)       = 'VEG_04.DAT                      ', CFTYP_VEG(1,4)       = 'ASCLLV',
                  CFNAM_VEG(1,5)       = 'VEG_05.DAT                      ', CFTYP_VEG(1,5)       = 'ASCLLV',
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                  CFNAM_VEG(1,7)       = 'VEG_07.DAT                      ', CFTYP_VEG(1,7)       = 'ASCLLV',
                  CFNAM_VEG(1,8)       = 'VEG_08.DAT                      ', CFTYP_VEG(1,8)       = 'ASCLLV',
                  CFNAM_VEG(1,9)       = 'VEG_09.DAT                      ', CFTYP_VEG(1,9)       = 'ASCLLV',
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                  CFNAM_VEG(1,11)      = 'VEG_11.DAT                      ', CFTYP_VEG(1,11)      = 'ASCLLV',
                  CFNAM_VEG(1,12)      = 'VEG_12.DAT                      ', CFTYP_VEG(1,12)      = 'ASCLLV',
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                  CFNAM_LAI(1,3)       = 'LAI_03.DAT                      ', CFTYP_LAI(1,3)       = 'ASCLLV',
                  CFNAM_LAI(1,4)       = 'LAI_04.DAT                      ', CFTYP_LAI(1,4)       = 'ASCLLV',
                  CFNAM_LAI(1,5)       = 'LAI_05.DAT                      ', CFTYP_LAI(1,5)       = 'ASCLLV',
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                  CFNAM_LAI(1,8)       = 'LAI_08.DAT                      ', CFTYP_LAI(1,8)       = 'ASCLLV',
                  CFNAM_LAI(1,9)       = 'LAI_09.DAT                      ', CFTYP_LAI(1,9)       = 'ASCLLV',
                  CFNAM_LAI(1,10)      = 'LAI_10.DAT                      ', CFTYP_LAI(1,10)      = 'ASCLLV',
                  CFNAM_LAI(1,11)      = 'LAI_11.DAT                      ', CFTYP_LAI(1,11)      = 'ASCLLV',
                  CFNAM_LAI(1,12)      = 'LAI_12.DAT                      ', CFTYP_LAI(1,12)      = 'ASCLLV',
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                  CFNAM_Z0(1,8)        = 'Z0_08.DAT                       ', CFTYP_Z0(1,8)        = 'ASCLLV',
                  CFNAM_Z0(1,9)        = 'Z0_09.DAT                       ', CFTYP_Z0(1,9)        = 'ASCLLV',
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                  CFNAM_Z0(1,11)       = 'Z0_11.DAT                       ', CFTYP_Z0(1,11)       = 'ASCLLV',
                  CFNAM_Z0(1,12)       = 'Z0_12.DAT                       ', CFTYP_Z0(1,12)       = 'ASCLLV',
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                  CFNAM_EMIS(1,2)      = 'EMIS_02.DAT                     ', CFTYP_EMIS(1,2)      = 'ASCLLV',
                  CFNAM_EMIS(1,3)      = 'EMIS_03.DAT                     ', CFTYP_EMIS(1,3)      = 'ASCLLV',
                  CFNAM_EMIS(1,4)      = 'EMIS_04.DAT                     ', CFTYP_EMIS(1,4)      = 'ASCLLV',
                  CFNAM_EMIS(1,5)      = 'EMIS_05.DAT                     ', CFTYP_EMIS(1,5)      = 'ASCLLV',
                  CFNAM_EMIS(1,6)      = 'EMIS_06.DAT                     ', CFTYP_EMIS(1,6)      = 'ASCLLV',
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                  CFNAM_EMIS(1,8)      = 'EMIS_08.DAT                     ', CFTYP_EMIS(1,8)      = 'ASCLLV',
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                  CFNAM_EMIS(1,12)     = 'EMIS_12.DAT                     ', CFTYP_EMIS(1,12)     = 'ASCLLV',
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                  CFNAM_DG(1,3)        = 'DG_3.DAT                        ', CFTYP_DG(1,3)        = 'ASCLLV',
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                    CFNAM_Z0_O_Z0H(1)    = 'Z0_O_Z0H.DAT                ', CFTYP_Z0_O_Z0H(1)    = 'ASCLLV',
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                    CFNAM_RGL(1)         = 'RGL.DAT                     ', CFTYP_RGL(1)         = 'ASCLLV',
                    CFNAM_CV(1)          = 'CV.DAT                      ', CFTYP_CV(1)          = 'ASCLLV',
                    CFNAM_ALBNIR_VEG(1)  = 'ALBNIR_VEG.DAT              ', CFTYP_ALBNIR_VEG(1)  = 'ASCLLV',
                    CFNAM_ALBVIS_VEG(1)  = 'ALBVIS_VEG.DAT              ', CFTYP_ALBVIS_VEG(1)  = 'ASCLLV',
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                    CFNAM_ALBNIR_SOIL(1) = 'ALBNIR_SOIL.DAT             ', CFTYP_ALBNIR_SOIL(1) = 'ASCLLV',
                    CFNAM_ALBVIS_SOIL(1) = 'ALBVIS_SOIL.DAT             ', CFTYP_ALBVIS_SOIL(1) = 'ASCLLV',
                    CFNAM_ALBUV_SOIL(1)  = 'ALBUV_SOIL.DAT              ', CFTYP_ALBUV_SOIL(1)  = 'ASCLLV',
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                    CFNAM_BSLAI(1)       = 'BSLAI.DAT                   ', CFTYP_BSLAI(1)       = 'ASCLLV',
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                    CFNAM_SEFOLD(1)      = 'SEFOLD.DAT                  ', CFTYP_SEFOLD(1)      = 'ASCLLV',
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                    CFNAM_F2I(1)         = 'F2I.DAT                     ', CFTYP_F2I(1)         = 'ASCLLV',
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                    CFNAM_CF_NITRO(1)    = 'CF_NITRO.DAT                ', CFTYP_CF_NITRO(1)    = 'ASCLLV',
                    CFNAM_CNA_NITRO(1)   = 'CNA_NITRO.DAT               ', CFTYP_CNA_NITRO(1)   = 'ASCLLV',
/
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                    CFNAM_ALB_ROOF       = 'ALB_ROOF.DAT                ', CFTYP_ALB_ROOF       = 'ASCLLV',
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                        CSOILFRZ   = 'DEF'      ,
                        CDIFSFCOND = 'DEF '     ,
                        CSNOWRES   = 'DEF'      ,
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